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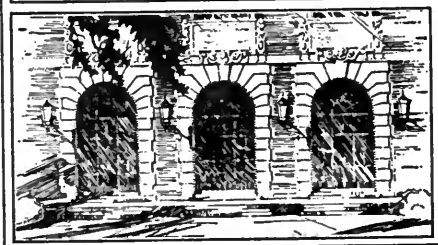
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# **INFORMATION RESOURCES IN THE ENVIRONMENTAL SCIENCES**

Edited by  
**GEORGE S. BONN**

Papers Presented at the  
18th Allerton Park Institute  
November 12-15, 1972

**University of Illinois  
Graduate School of Library Science  
Champaign-Urbana, Illinois**

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## Foreword

Each fall the University of Illinois Graduate School of Library Science, in cooperation with the Division of University Extension, holds a three-day Institute at Allerton Park, the University's conference center near Monticello, Illinois, about twenty-five miles southwest of Champaign-Urbana. The 1972 Institute on Information Resources in the Environmental Sciences is the eighteenth in the series and was cosponsored by the Illinois Institute for Environmental Quality.

While the environment, broadly defined, has long been a concern of many writers, it has only been since the middle 1960s that the environment has become the concern of almost everybody in the United States and of many people in other countries as well. The resulting proliferation of diverse points of view and of diverse agencies, organizations, and spokesmen in the broad field of the environmental sciences has further resulted in the proliferation of all kinds of publications and of other sources of environmental information. It is to these information resources—their production, their development, and their use—that the 1972 Allerton Park Institute directed its attention.

It was singularly appropriate that a conference on the environment should have been held at Allerton Park in 1972. Allerton Park, a 1,500-acre tract of native Illinois river bottomland, was given to the University of Illinois in 1946 by Robert Allerton to be used by the University as an educational and research center, as a forest and wildlife and plantlife reserve, as an example of landscape architecture, and as a public park. In recognition of its uniqueness as a large tract of fast-disappearing native river bottomland, the U.S. Department of the Interior declared it a national landmark in 1970. For several years now Allerton Park has been the center of a controversy between the Army Corps of Engineers which plans to create a water supply reservoir by building a dam ten miles downstream on the Sangamon River which flows through the park, and a committee of concerned citizens who say that, under

periodic flood conditions, some 1,100 acres of Allerton Park bottomland would be ruined in course of time as both nature reserve and public park. As a state institution the University is caught in the middle, but some sort of compromise is likely to be worked out.

It was also appropriate that the Illinois Institute for Environmental Quality (IIEQ) should have been a cosponsor of this Allerton Park Institute. The IIEQ was one of three state agencies set up by the Environmental Protection Act passed by the Illinois General Assembly in 1970. The multiple purpose of the IIEQ is to support and to do research, to propose regulations, to provide expert witnesses and advice, and to insure that all relevant data and points of view are heard and considered by the other two agencies (Environmental Protection Agency and Pollution Control Board). Obviously information is one of the IIEQ's major concerns, and its information services are accordingly well organized and highly developed.

It was noteworthy that almost every paper in this volume echoed the appeal of the keynote speaker—that librarians be activists, that they pay as much or more attention to the dissemination and the use of their collections as they do to the acquisition, organization, and control of their collections. It is good to be reminded occasionally about what librarians really ought to be and ought to be doing, but it is a little sad that so many people, both librarians and nonlibrarians, seemed to think it necessary to bring the matter up at all.

The keynote speaker also suggested a rather provocative aim, function, or perhaps description of a library, particularly a public library—that it be a “credible threat to bureaucracy.” I like that: a credible threat to bureaucracy! The implications, the challenge, the virtue in those four words give librarians something to think about.

In the final prepared paper for the Institute the speaker pointed out, quite rightly, that *no* social change, no matter how timely, beneficial, or necessary for the public good, can be brought about unless and until the public is willing to accept it as an alternative to existing conditions. It is generally agreed that our environment, broadly defined, needs to be cleaned up, protected, and preserved for ourselves and for future generations, but it is still uncertain that society is ready and willing to do the needful. All the information resources in the environmental sciences that can be mustered will be needed to help society make up its mind.

Between the keynote address and the final paper were informational papers on the work (and works) of various interested agencies, institutions, and organizations in the field; descriptive papers on information centers and services with emphasis on the environmental sciences; and practical papers on the development of environmental information collections for different kinds of libraries. An expert summary and outlook paper brought the Institute to a close. (For the record, the paper by James G. Kollegger was presented at the

Institute by Arthur D. Kramer of Microfiche Publications, an associate company of Kollegger's.)

The members of the planning committee for the 1972 Allerton Park Institute included Winifred Ladley, F. Wilfrid Lancaster, and George S. Bonn from the Graduate School of Library Science, and Angela Imberman from the Illinois Institute for Environmental Quality whose firsthand knowledge of persons, organizations, activities, and publications in the field proved invaluable in arranging the program. Other members of the faculty and a number of students from the library school helped in various ways to make the Institute a success. Business details of the Institute were in the experienced hands of Leonard E. Sigler and his staff in the Division of University Extension and of Joseph Devorak and his staff at Allerton House. To the distinguished speakers who gave so much of themselves and of their time and to all others who participated in any way in the Institute, the Planning Committee is indeed grateful. Especial thanks must go to Barbara DiNovo and her staff in the Publications Office of the Graduate School of Library Science for their part in getting these papers published so promptly.

George S. Bonn

*Chairman, Planning Committee*

January 1973

MICHAEL SCHNEIDERMAN  
Director  
Illinois Institute for Environmental Quality

## Librarians As Environmental Activists

Librarians are sometimes thought to be classic passive resources—seen and not heard—peacefully waiting for their clientele to approach. Incentive is supposed to come from users while librarians wait to serve. Therefore much librarianship seems devoted to preparing to satisfy people who may show up on their own. Whatever degree of validity this view has for most libraries, it is unacceptable for environmental libraries and for environmental collections in general libraries. These libraries and collections cannot be wallflowers. The passive view makes too little of them. The rest of the papers for this conference deal with the passive functions of environmental libraries; I will deal with some of the important active functions.

### THE SETTING

Environmental quality is a creature, and occasionally a victim, of decisions made at many levels of government and in the private sector. These include decisions to do things, and to not do things. Virtually everything that government does affects the environment: such major activities as highway and dam construction, and some less visible functions such as purchasing. The vast regulatory functions of governments affect many private activities which in turn affect the environment.

Private decisions have the potential for significant environmental impact. The most visible are decisions to build on the landscape or to change it. Decisions to locate power plants, to build in flood plains, to strip mine, and to undertake major residential or industrial development, all have significant impact on the environment. Many conflicts between ambitious plans and environmental preservation cannot be resolved. We cannot both industrialize our river banks and save them; we cannot both live in electrified luxury and

avoid the environmental impact of more and bigger power plants; and we cannot both enjoy the benefits of some pesticides and avoid their destructive side effects.

Many conflicts can be resolved. Where these possibilities exist, they are often not realized, mainly because many decisions are ill-informed. While occasionally the ignorance of the decision-maker is a conscious, studied effort to avoid the truth, our experience in government suggests that more often ignorance is accidental. Decision-makers usually have no convenient way of learning about or access to information resources.

Government has developed procedures for curing some of these problems. The National Environmental Policy Act, adopted in 1969, requires a detailed environmental impact statement before certain decisions significantly affecting the environment can take effect.<sup>1</sup> State laws passed in the last two years in Illinois have similar requirements.<sup>2</sup> In response to such requirements, a relatively careful study of many factors is now undertaken before decisions are made.

Similarly, private developers whose financing and profits depend upon an efficient and predictable flow of events take great pains to avoid environmental opposition and controversy in their activities. Although no statutory compulsion requires environmental impact analysis, in many cases of purely private action there is a sensitivity to environmental issues in the early planning process because of the need to avoid the delays associated with conflicts over environmental values.

Experience in the Illinois Institute for Environmental Quality, with both public and private agencies in the environmental impact business, is that the flow of information necessary to do a good job on these statements is not all that it should be. The IIEQ is the principal state government resource for assisting other agencies with environmental impact analysis. It has worked on such major projects as the new East St. Louis airport and power plant sitings. It has also developed tools for analysis of new highways and transportation systems, and advised many agencies with respect to compliance with Illinois environmental impact analysis requirements.

We see two classes of problems: (1) the task is so great that most agencies cannot always do an adequate job; and (2) even when a good job is attempted, the shortage and inaccessibility of information resources is critical. Often this is because the state of the art in the relevant fields does not permit adequate analysis. We have repeatedly found, however, that the problem is lack of knowledge of or access to existing materials.

Members of public and citizens groups who have assumed substantial responsibility for policing this process also have poor access to information resources. One result is that the procedures which are designed to maximize the utilization of available information succeed only in revealing the lack of use of such information.

Many decisions affecting the environment occur in settings in which substantial resources are not available for detailed and careful research programs. Local zoning decisions, a variety of state decisions on the environment, and many low-visibility decisions in the federal government, simply do not benefit from the kind of detailed study which now must accompany major undertakings.

The final environmental impact statement for the East St. Louis airport covers hundreds of pages, took more than a year to complete, and cost nearly \$100,000; power plant statements weigh several pounds and require similar resources. Clearly, most activity does not receive this kind of attention. If it did, we would soon be faced with a chronic shortage of analysts, scientists, ecologists, and other experts needed to do the job properly. It is a problem of allocation of scarce resources, lack of time, and relative lack of importance of the decisions. A complete and thorough study cannot be done on every decision made by every government. Thus, the major thorough study resources are reserved for the major decisions.

Many private decisions which affect the environment are made by people who do not have the resources to do an adequate job. For example, an adequate environmental analysis of proposed strip mining under Illinois's new strip mine law is well within the reach of a major coal company, but not of a small family-owned and operated quarry. A major power company can afford the cost of massive, even scholarly, environmental analysis, but a small foundry cannot. In the absence of a subsidized information resource, the job will be incompletely done. The alternative is to put small quarry operators and small companies out of business, which is neither desirable nor probable.

Where an intensive analysis is beyond reach, the best job possible with available resources should be done. This often means use of reports, books, periodicals, research documents, government publications, and all of the other things which librarians gather and keep.

Many decisions affecting the environment are made at many points in and out of government without adequate access to environmental information. Librarians and information officers have a responsibility to improve the information base for these decisions. Librarians can abandon their neutrality and work for the active use of their resources; they can work to break down barriers to release of information; and they can make their presence known to decision-makers in such a way that the existence of the library serves as a deterrent to irresponsible decisions.

## ACTIVE USE OF ENVIRONMENTAL INFORMATION RESOURCES

Traditionally, information centers are neutral turf. Particularly in the case of public and academic libraries, users expect the library to stay out of contro-

versy. The common pose of libraries and librarians is low profile, aloof from the fray and far away from controversy. Librarians should not be proponents of particular ideas in the materials which their libraries store. Neutrality with respect to ideas is an important value and essential to the utility of the library in the processes of decision-making. But one idea deserves the active sponsorship of the librarian. It is the idea that the materials housed within the facility ought to be used, and used often and well. The librarian should be a clear proponent of this position.

On the issue of active use of the facility, neutrality is neither possible nor sensible. In the first place, what passes for neutrality really is not. A passive stance, waiting with the doors open for users to arrive to make what use they will of the facility, is not neutral at all. It places the librarian's thumb on the scale in favor of the people who are aware of the facility and know how to use it. There is nothing neutral about operating a departmental library about which some people are fully informed, and others are not; the well-informed will use it, and the others will not.

Even assuming that neutrality were possible, it is still unacceptable. When decisions are being made on the basis of inadequate information, the librarian's passive role is irresponsible. The same zeal which is often reserved for insuring that borrowed materials are returned on time can be turned toward insuring that borrowable materials are in fact borrowed. An active role, focused on active use of the materials housed within the library, can improve the quality of environmental decision-making. This is easier for special libraries housed in active organizations. The challenge is somewhat greater for the academic or public library. Without taking sides on the substance of decisions made by their users, librarians can work to insure that decisions made by people who might use the library are made only after the library is used.

Libraries owned by decision-making agencies have a natural constituency to serve. For them, the responsibility is to insure that their sponsors make maximum use of the facility. The decision-making process might include a check by the librarian that all that is relevant is affirmatively called to the attention of the decision-maker. No librarian can insure that materials made available are in fact used. But the librarian can insure that relevant materials are made available and that decision-makers, to ignore them, must actively decide to ignore them.

Libraries which do not have ready-made constituencies, such as academic and public libraries, have a different responsibility. They must seek out users and actively serve them. Zoning boards, local government bodies, state governments, private developers, and others who affect the environment should be reached and actively encouraged to make use of what the library has to offer. Waiting for the library telephone to ring is a failure to serve. Decision-makers, particularly at the local government level, must be helped to want to use the

library, and then to use it. Academic libraries have the same duty to participate in decision-making by seeking users. Institutions of higher learning in Illinois have an uneven record of serving government. But where they serve, they serve well and improve the functioning of government as no other resource can. The role of academic libraries in the governing process is largely unexplored. The initiative must come from the libraries.

Librarians have the skill to do things which are not conveniently done elsewhere. The library in the IIEQ provides bibliographies, literature searches, summaries of materials, and other helpful aids which make mounds of technical material readily usable in the decision-making process. The storage of materials and their cataloging, while important steps to insure access, are not enough. Most of the decision-makers whom libraries serve have neither the resources nor the time to undertake a major thorough research project in support of every decision which they make. They need digested material which librarians can provide.

The librarian cannot take the place of a professional research analyst. He cannot substitute his expertise in information resource handling for the substantive expertise contained in the materials. Nor can he pose as a scientist or expert. He can find, organize, condense and abstract materials, and make them available. This is something which librarians must do if they are to improve the work of the people who affect the environment.

Librarians often hesitate to venture into controversial areas, but that reluctance affects the impact of their work. By staying out of the controversy over whether their libraries should be used, librarians miss opportunities to affect important environmental results. By extending the notion of neutrality to cover the issue of whether the resources are used at all, librarians take a position on a controversial issue of public importance.

Environmental quality decisions must be improved. During the last four years in Illinois, partly through the work of the IIEQ, the quality of these decisions has been improved. Such successes would have been impossible without the studied activism of the Institute's library facility, and other information resources styled after library facilities. It is impossible for society to make environmentally correct decisions, and avoid environmental mistakes, unless the people who control and manage information resources emerge from behind their desks and actively fight for their utility and importance.

## FREE FLOW OF INFORMATION

Librarians, more than most people, have a duty to insure the free flow of information. The practice among some producers of information is rather restrictive. Documents containing useful data and information sometimes are withheld from public view, or even the view of government. Such barriers must fall if environmental decisions are to be well-informed. The federal

Freedom of Information Act<sup>3</sup> provides for relatively expansive opening of the files of government agencies. With some exceptions, it orders broad public access to agency materials. The Illinois Environmental Protection Act provides for the files, records, and data of the state's environmental agencies to be "open to reasonable public inspection."<sup>4</sup> I do not know of any reluctance by any agency in the Illinois program to comply with the letter and spirit of this provision. No formal complaints have been filed and all requests have been satisfied. The federal government, however, has been the target of many suits to force disclosure of information under the Freedom of Information Act. Furthermore, we in the Illinois environmental program have experienced difficulties in extracting environmental research results and other data from federal agencies.

Librarians can be among the most effective workers for opening up their own organizations. They can use their considerable internal influence to persuade the people with the keys to information to unlock the barriers to entry and scrutiny. Litigation under appropriate statutes has its place. But internal pressure by information and library officers is likely to produce better results. Lawsuits can never cover the entire range of secret data. They are costly and time-consuming.

People within agencies are well placed to analyze their agency's public access rules; librarians are often charged with enforcing them. They can use their position and influence to break down the obstacles to full disclosure of useful materials. Librarians have a similar duty with respect to agencies and organizations other than their own. On many occasions, the librarian of the IIEQ has been the cutting edge with which state-government has gained access to remote or hidden materials. Librarians have a role to play as guardians against censorship. Their business is the free flow of information. It is not enough to celebrate that goal through traditional librarians' devices, such as bigger and better catalogs and longer hours.

Some bureaucracies tend to polish the negative out of their work product. As work of significance rises through the many stages of review of a large organization—whether or not in government—information which may be thought to be threatening can be honed away. Librarians can work to maximize openness. Duties of loyalty and law prevent open defiance of decisions to withhold materials or edit them. That imposes an even greater burden on the insiders to advocate openness on behalf of a constituency which has no other voice inside.

## PROMOTING BETTER DECISIONS

The content of an environmental library is less important than its existence. Bureaucratic decision-making is characterized by a strong will to survive. Survival is best insured if the amount of criticism and challenge is reduced. A principal effect of the National Environmental Policy Act has been a vast

improvement in the environmental sensitivity in agency decisions. It is a result which grows, in part, from the desire of low-level decision-makers and their chiefs to be free of controversy to the extent possible.

Controversy presupposes an informed complainer. Bureaucrats tend to ignore the angry, but uninformed, objector to proposed action. Although that is a serious error, it appears to be a common one. To the extent that government behavior responds to the threat of informed objection, it is the threat that is the operative agent of control. More specifically, it is the probability that criticism will be informed criticism that causes a significant impact on the decision-making process.

A library which is good enough and open enough to supply the basis for informed comment is a powerful place. Its power derives not from the use that is actually made of it, but from the use which might be made of it. In the process, a great deal of noisy opposition and cumbersome litigation may be avoided. The quality of decisions will be improved. For such influence to be felt, the library or information facility must be credible. It need not have its bluff—if it is a bluff—called often to have an impact on virtually everything that goes on in its organization.

We have such a facility in the IIEQ. A later paper in this volume by Angela Imberman, the excellent creator of the facility, provides some detail. My job requires me to assist other agencies in their confrontations with environmental problems. Our very credible library is a lever within the state bureaucracy on behalf of environmentally sensitive results. Based on my observations, I think that our library's greatest impact has been in its presence, rather than its actual use.

For the last several years, the IIEQ has participated in many attempts to reform state government and increase its sensitivity to environmental information and values as decisions are made. That experience leads me to conclude that many environmental mistakes are accidents. They arise from the lack of adequate information. We have learned that some relatively simple devices can substantially reduce the number of mistakes. The IIEQ has published an Illinois data catalog which describes and locates data files concerning the state which are collected by a variety of state, local, and federal agencies. In talking to users of the catalog, we have found that information which has not been used in the past is now used and, in fact, changes decisions.

Most librarians have had the experience of satisfying a request for relevant information from somebody about to make an important decision. The feeling is one of immense satisfaction of having improved a result. Ad hoc victories of that sort can be systematized in order that hundreds of decisions made in and out of government will be better informed than they are today. Reliance on complex procedures, such as those provided under the National Environmental Policy Act, has its grace. The success of that act, and laws like it, cannot be denied. But these are cumbersome, expensive, and not wholly effective tools.

The process itself must be reformed, and that is the kind of job which is done best from the inside.

Relatively few insiders have the same singleness of purpose that librarians have. They, almost alone in the organization, carry the message that information is a good thing and ought to be used. Without violating confidences or loyalties, librarians can materially change the quality of the work done by their constituencies. But that requires an active commitment to the goal, and a strategy carefully pursued. No librarian can be content to open the shelves in the morning and beg borrowers to return the books. Opportunities are lost every day while librarians overlook their duties to improve information use. I think librarians can change this pattern of passiveness, and I think they should.

#### REFERENCES

1. 42 U.S.C. §4321, 4331-35, 4341-47. (P.L. 91-190)
2. E.g., *Illinois Revised Statutes*. Illinois Environmental Protection Act, Ch. 111-1/2, §1047 (B); Illinois Surface Mined Land Conservation Act, Ch. 93, §205.
3. 5 U.S.C. §552.
4. *Illinois Revised Statutes, op. cit.*, Ch. 111-1/2, §1007.

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## Government Agencies

Despite efforts in recent years to consolidate environmental programs at the federal government level, the complexity and multi-disciplinary aspects of the subject make this very difficult, if indeed, not impossible. Problems encountered in attempts to designate focal points for the environment are reflected in organizational patterns, in information services developed to support the subject area, and in publications resulting from the various programs and information services.

Programs related to the environment cut across a number of lines in varying degrees. Aspects of the problem can be defined as: scientific, technical, legal, social, economic, managerial, health, cultural, administrative, and many others. Nearly all scientific disciplines as well as those of the social sciences are involved.

Since the environment touches every aspect of the world and human existence and since the federal government is responsible for the well-being of its citizens and the nation, it is understandable that at this time the *United States Government Organization Manual 1972/73* lists approximately eighty departments, agencies and offices which have responsibilities in the ecology or conservation and environmental programs of the federal government. These responsibilities may be policy-making, regulatory, research or administrative; they may be related to specific areas such as urban and rural life, population, education, energy resources, land use, or areas such as air, water, noise and solid waste. They may involve what appear to be conflicting responsibilities such as in the case of pesticides and radiation.

The National Environmental Policy Act of 1969 established the Council on Environmental Quality in the Executive Office of the President to deal with the formulation of national policy relating to all aspects of the environment and to recommend these to the president in an attempt to improve the quality of the environment through major governmental action. The following year the Environmental Protection Agency was established as an independent

agency, with research, monitoring, standard setting and enforcement responsibilities, to coordinate governmental action for pollution abatement and control. It is the line organization directly charged with protecting and improving the environment, with primary responsibilities in air, water, pesticides, radiation, and solid waste. Noise has just been added by recent passage and signing of the Noise Control Act of 1972. Also in 1970 the National Oceanic and Atmospheric Administration was established under the Department of Commerce with administrative, research, monitoring, forecasting and mapping and charting responsibilities in areas relating to meteorology, oceanography, geodesy and seismology. The establishment of both the EPA and NOAA attempted to consolidate similar offices in various government agencies. This is not to say that each of these agencies did not retain environmental responsibilities, for they did—in areas of concern still directly related to their missions.

## ENVIRONMENTAL INFORMATION

Realizing the importance of information to the task of improving the quality of the environment, in March 1970, the Office of Science and Technology, Executive Office of the President established the so-called SEQUIP Committee. This ad hoc committee was to study and report on the status of scientific and technical information organizations in the federal agencies concerned with the protection and improvement of the environment, and any generalized programs serving the community of environmentalists. Unfortunately this report is still tied up in the review process, although partial findings have appeared in the *Congressional Record*.<sup>1</sup> The committee found that primary documentation is more dispersed in this field than most because environment or environmental quality and pollution are not well defined disciplines but cut across numerous other disciplines in rather undefined and uncoordinated patterns. Authority for interaction with other government information activities is often outside the scope of the activity or its agency's mission. The committee found that the same problems exist with the organization of activities established to handle environmental programs—namely some gaps of coverage, more overlap, and frustrations for the user in trying to identify and locate required information. One such gap identified was the lack of an environment table of contents service in the environmental field, and an example of overlap is the number of activities scanning the same primary publications for input to their own abstracting and indexing services. In regard to this latter case, it was recommended that the identification of relevant articles in a given environmental subject area be left to conventional services, who could possibly be encouraged to change some terminology or rules of input to more clearly reflect an item's coverage of the subject. Specific areas of concern related to the lack of standardization in government-produced tape

services; the lack, or inadequacy, of indexing in government report literature; the need for a referral activity in EPA and elsewhere, or the expansion of the Library of Congress National Referral Center's activities in this area; and the need for formal reviews or evaluations of information programs by outside advisory bodies.

Recognizing that the scientific and technical environmental programs represented only a portion of the information needs in this field, sensing the growing need for a mechanism for bringing other areas to the forefront of discussions in this area and responding to requests and criticisms from all segments of user communities, the EPA, with the encouragement and support of other federal government organizations, in September 1972 sponsored a National Environmental Information Symposium in Cincinnati, Ohio. This symposium provided discussion of sources of information and data centers, publications, document services and referral activities; services available; and methods of access to environmentally related legal, legislative, regulatory, planning and management, and socio-economic as well as scientific and technical information. Findings and recommendations from this meeting will be available through the summary report and a volume containing the papers presented.

### **Federal Government Activities Concerned with the Environment**

Departments and bureaus of the federal government are responsible for carrying out the missions assigned to them by the laws which create them. In this section a brief summary of the various organizations and their responsibilities will be given; the chart in appendix A may clarify some of the points made here. Only environmentally related aspects of each department or agency are of concern, since only two organizations, the Council on Environmental Quality and the EPA, are totally involved with matters related to the environment and are independent of larger governmental units.

The Office of Economic Opportunity, as well as CEQ, is part of the Executive Office of the President, and although its mission is much broader, it is concerned with environmental matters directly related to its health service delivery programs such as development of facilities for sanitary disposal of human wastes and for potable water supplies.

Under the Department of Agriculture there are seven offices with some mission responsibilities related to the environment, specifically in water conservation, safe use of pesticides and development of alternatives to their use, soil conservation, land use for resource protection, community water, and waste disposal systems. The offices' responsibilities vary from research and technology transfer to regulatory control and monitoring programs.

The mission of the Department of Commerce's National Oceanic and Atmospheric Administration is almost totally environment-oriented with primary responsibilities in meteorology, oceanography and other areas outlined

earlier. In addition to this administration, the department has four other divisions with special responsibilities in the subject: the National Industrial Pollution Control Council which serves as a liaison with industry in support of pollution control; the Maritime Administration charged with research aimed at eliminating marine pollution resulting from shipping; the Patent Office which has a priority program for the review of applications for patents which could have impact on environmental issues; and the National Bureau of Standards whose measurement programs in chemistry and other areas have heavy implications for the improvement of environmental quality. The National Technical Information Service will be discussed later in the section on specific governmental information programs and publications.

Although unknown to many, the DOD sponsors environmental programs which, in fiscal year 1972, totalled \$19,914,000 and in fiscal year 1973 will be \$35,977,000. DOD directive 5100.50, "Protection and Enhancement of Environmental Quality," implemented Executive Order 11507, "Prevention, Control, and Abatement of Air and Water Pollution at Federal Facilities," and Executive Order 11514, "Protection and Enhancement of Environmental Quality" which followed the National Environmental Policy Act of 1969 (Public Law 91-190). Implementation responsibility was assigned to the assistant secretaries of defense for health and environment and installations and logistics, the director of defense research and engineering and the secretaries of the military departments. Army programs are directed toward vehicle and mobile sources and army aircraft; bio-medical effects of noise and electromagnetic radiation; air, water and solid waste disposal; and construction and facility operation. Navy programs are encompassed by ship waste management; oil spills and control; aircraft pollution abatement; ordnance disposal; and development of an environmental data base. Major air force programs are in aircraft and missile emissions and control, noise and sonic boom effects, electromagnetic effects, ground facility support, hazardous material handling, and evaluation and control of noxious effluents in the atmosphere. An area coordinating paper on environmental quality (presently in the first draft state) identifying current work, overlap and duplication, and defining gaps will assist in the development of long-range programs.

The Department of HEW has seven activities deeply involved in the health aspects of environmental pollution, several under the Public Health Service's National Institutes of Health, and one, the Bureau of Radiological Health, in the Food and Drug Administration, which itself has a large enforcement role. Several of the well-developed environmental programs of the federal government are under the jurisdiction of HEW.

Two assistant secretariates—community development and research and technology—of the Department of Housing and Urban Development carry out this department's responsibilities related to neighborhood water and sewer facilities, improved land use, waste disposal energy systems and noise abatement.

The Department of Interior retained numerous environmentally related functions, even in the water area which made up a large portion of EPA's inheritance from that department. Ten separate offices and bureaus share DI's responsibilities for oil and gas production effects, conversion of coal into clean alternatives, saline water conversion, water resources research, protection of fish and wildlife resources, conservations of estuaries, mineral-based products effects, water data acquisition, collection and processing of remote-sensing data, and land management and reclamation.

While the Justice Department has no full-scale program in the environment, its Land and Natural Resources Division is responsible for prosecutions for water and air pollution. The State Department's Bureau of International Scientific and Technological Affairs carries out policy recommendations relating to cooperation in atmospheric and environmental sciences at the international level, while its Agency for International Development is more concerned with providing information to developing countries.

Within the Department of Transportation, six offices share responsibilities for the environmental programs related to transportation noise and noise abatement research, research on the impact of highway transportation, management of environmental and urban transportation needs, smoke emission from aircraft, and marine environmental protection programs. The National Response Center was assigned to the U.S. Coast Guard by the National Oil and Hazardous Materials Pollution Contingency Plan of 1970, thus adding to its responsibility for the prevention, detection and control of pollution on or adjacent to navigable waters. The enforcement of other agency prohibitions against discharge of refuse and oil on coastal navigable waters is assigned to the Department of Treasury's Bureau of Customs under the Oil Pollution Act.

In addition to offices within the departments outlined above, many independent agencies have missions which encompass environmental activities. EPA, of course, is an independent agency whose sole mission is in this area. The Delaware River Basin Commission carries out projects related to the abatement of water pollution, soil conservation and watersheds within the basin; the Federal Maritime Commission administers a section of the Water Quality Improvement Act of 1970 requiring evidence of financial responsibility of owners and operators of vessels which may be liable for the cost of removal of oil from U.S. waters. Development—of methods for radioactive waste disposal from nuclear operations, studies of possible effects of heated radioactivity into water, and control of quantities of radioactivity released into the environment—is the responsibility of the AEC. In order to support its mission, the AEC has established a number of specialized information centers which will be discussed later. The Federal Power Commission has more of a participating role than direct responsibility, cooperating with other agencies in the development and use of water and related land resources.

Because the District of Columbia is a federal government activity, it is necessary to include its Department of Environmental Services in any survey of government environmental programs, although its responsibilities to protect its residents from the effects of environmental pollution more closely resemble programs at state and city levels.

Two offices within the General Services Administration—the Office of Environmental Affairs and the Federal Supply Service—carry out this administration's activities related to development and testing alternate fuels for use in motor vehicles, recycling techniques and methods of noise abatement and control.

Although the National Aeronautics and Space Administration's primary research mission is directed to other areas, applications of benefit to the improvement of environmental conditions have resulted, including earth observations and materials sciences. The National Science Foundation sponsors research which is directly or indirectly applicable to environmental problems through its Research Applied to National Needs Program, and through its Office of Science Information and the Foundation Research Directorate's Division of Environmental Sciences.

The Smithsonian Institution has seven offices with environmental programs, most involving research or the support of research in ecology, oceanography and limnology. Its Office of Environmental Sciences operates the Center for Short-Lived Phenomena.

Although the focus of TVA's programs are locally oriented, they have wide applications elsewhere in planning resource conservation. Several committees and commissions exist within the federal government framework to advise, study and report on specific areas of environmental concern. These are included in appendix A: The Federal Council for Science and Technology has an Ad Hoc Committee on Environmental Quality Research and Development and a Committee on Water Resources Research whose work is totally related to environmental activities. The Office of Science and Technology of the council sponsors projects in this area as well.

Any discussion of federal government activities cannot ignore the role of the U.S. Congress in its sponsorship of laws designed to protect the environment of the nation and the world. It would be impossible to list all the committees and subcommittees which have studied the problems and long- and short-range effects of pollution, and which have attempted to legislate actions to improve the quality of the environment. It may be argued that efforts are rightly or wrongly directed, that they are too diffuse and too dispersed, that they are token or pacification actions, or that they are too binding, but they do represent the interests of the American people in the problems at hand, and substantial efforts to do something about them. A quick look at the *Congressional Record* index shows how extensive these

efforts are and how many pieces of legislation have implications for one or several aspects of environmental concerns.

Any review of what has been stated in this discussion of federal government activities concerned with the environment will show that in most instances, responsibilities for similar aspects are shared by more than one organization. It will also become apparent that varying types of responsibility are assigned to various problems. For instance, research conducted by the AEC concerning heated radioactivity in streams can be used in support of standard setting, monitoring and enforcement activities of the EPA and by the Justice Department in its prosecutions for water pollution. Land use is a research responsibility of the Departments of Agriculture and HUD and the Federal Highway Administration, an administrative responsibility of the Department of Interior and the Department of Agriculture, and a prosecuting responsibility of the Justice Department. Oil spills and pollution fall within the missions of nine organizations with varying degrees of responsibility, including NOAA (research), the Maritime Administration (research), the navy (research and administrative), DI (research and administrative), EPA (regulation and enforcement), Coast Guard (enforcement), Bureau of Customs (enforcement), Federal Maritime Administration (administrative), and Justice Department (prosecuting). Pesticides programs are still scattered among the Departments of Agriculture, Interior, HEW and the EPA.

CEQ and EPA are ultimately responsible for the review of environmental impact statements, with DOD and the individual military departments, HEW, HUD, DOT, DI, and the AEC responsible for the preparation and review of these statements on projects emanating from their offices.

### **Environmental Information Services and Publications**

The previously mentioned SEQUIP Committee established in 1970 to study environmental quality information services, identified some seventy-three data and information programs. Twenty-five of the information programs were related to the physical sciences, twenty-nine dealt with biological sciences and the remaining were considered data centers. Many of the information analysis centers had been identified in earlier surveys carried out by the Committee on Scientific and Technical Information (COSATI) and other groups and individuals.

Information and data centers referred to in this paper perform activities of collection, indexing, extraction and evaluation and produce bibliographies, indexes and abstracts, evaluations, descriptive reviews, data compilations, critical reviews, and critical data compilations. Libraries in the major departments and agencies with environmental missions publish bibliographies, annotated listings of new materials and often their entire holdings catalogs. Other document services and referral centers publish directories, indexes, abstracts, current awareness listings and catalogs of materials available. This discussion of

federal government information programs and publications will focus on the types of activities outlined above.

Government publications in any subject area present problems for their actual and potential audiences due to the great number of them, their distribution channels, their lack of effective advertising of availability, and the sizes and subsequent dispersion of the organizations producing them. Probably the most serious problem lies in the tendency not to provide adequate indexes within the publication itself, especially since the majority of government publications are reports or documents, considered to be informal and often having short lifespans. Yet these reports, bulletins, hearings and laws contain important information for researchers, educators, planners, and the general public. Their formats and methods of publication (i.e., series, sets or summaries) complicate the situation more and it is now almost imperative that one use indexing and abstracting services or printed catalogs to identify the required items. This situation is no less true in the environmental information picture and may be even more complicated because of the multi-disciplinary coverage needed.

## INFORMATION PROGRAMS

The major environmental information programs are outlined in appendix B. Most of these activities are located within the Departments of Commerce, HEW, DI, DOD, AEC and EPA. Within the Department of Commerce, NOAA has organized its information centers under the Environmental Data Service, which at this time has one information center—the Environmental Science Information Center—and six data centers including the National Meteorological Center; National Climatic Center; National Geophysical and Solar-Terrestrial Data Center; National Oceanographic Data Center; World Data Center, A-Oceanography; and Center for Experiment Design and Data Analysis (CEDDA). NOAA's Air Resources Laboratories—Environmental Pollution Effects on Aquatic Resources Program and National Ocean Survey—are sources of additional environmental data. The Environmental Science Information Center is concerned with editing and publishing scientific and technical reports, the library operations within NOAA, and the collecting, indexing, abstracting, and announcement for NOAA's own documents and the retrieval of literature—based on information in its own and other information files. NOAA's publications are covered in the NTIS programs, including the data centers' annual data catalogs in the various subject areas of concentration.

The Department of Commerce also operates the Environmental Patent Priority Program in the Patent Office, the Alloy Data, Chemical Kinetics Information and Chemical Thermodynamic Data Centers within its National Bureau of Standards.

The AEC operates the Technical Information Center at Oak Ridge to collect, organize and announce international nuclear science literature and disseminate its own reports. This center publishes *Nuclear Science Abstracts*. In addition, AEC supports, either singly or jointly with other organizations, seven centers which collect, process and perform retrieval services on literature related to the environment. These include the Ecological Information and Analysis Center at Battelle Memorial Institute, the Ecological Sciences Information Center, Environmental Mutagens Information Center, Information Center for Internal Exposure, Nuclear Safety Information Center, and Environmental Information Center at Las Vegas.

With the DOD, the air force operates the Environmental Technical Applications Center for collection, analysis and retrieval of environmental data; the agency's Engineer Agency for Resources Inventories provides environmental planning documents; the Environmental Hygiene Agency evaluates and disseminates toxicologic and environmental pollution data; and the Naval Facilities Engineering Laboratory collects and evaluates data on the environment as it is affected by ships and shore installations.

HEW has a number of information systems within its institutes and administrations which are directly concerned with health aspects of the environment and other aspects which relate indirectly. These include the Food and Drug Administration's Bureau of Radiological Health Office of Technical Information; the NIH's Carcinogenesis Bioassay Data System; the National Institutes of Environmental Health Sciences's Information Storage and Referral Section, the Toxicology Information Program, its computer-retrieval system—TOXICON, and the Toxicology Information Response Center at Oak Ridge National Laboratory; and the National Institute for Occupational Safety and Health's information program. The Carcinogenesis Bioassay Data System publishes *Carcinogenesis Abstracts*. In addition, the Office of Education sponsors the Science, Mathematics, and Environmental Education Information Analysis Center at Ohio State University under its ERIC program.

The Department of Interior's information and data centers include the Office of Mineral Information in the Bureau of Mines; the Engineering Reference Branch, Bureau of Reclamation; Outdoor Recreation Research Register, Bureau of Outdoor Recreation; the National Water Data Program and EROS Data Center (jointly sponsored by NASA) in the U.S. Geological Survey; the Office of Saline Water; and the Water Resources Scientific Information Center in the Office of Water Resources Research. The National Water Data Program publishes a *Catalog of Information on Water Data*. The WRSIC sponsors three retrieval centers at the University of Wisconsin, Cornell University and North Carolina State University, and from its central storage and retrieval center publishes, through NTIS, the *Selected Water Resources Abstracts*. The Smithsonian Institution's Science Information Exchange publishes the *Water Resources Research Catalog* under contract to WRSIC. The Eutrophication Infor-

mation Program is sponsored by the DI's Office of Water Resources Research, EPA, and the Department of Agriculture.

Within EPA there are no central information and data centers but several do exist within the various program offices. The Office of Air Programs' National Air Data Branch is a contribution of two data systems which existed before EPA was established and which collected and processed air quality data and meteorological emissions. Its Air Pollution Technical Information Center collects, abstracts and indexes literature in the field and publishes *Air Pollution Abstracts*. The Office of Pesticides Programs operates a Pesticides Information Center in its Division of Pesticides Information which indexes and abstracts literature for inclusion in *Health Aspects of Pesticides Abstract Bulletin*. This office also publishes the *Pesticides Monitoring Journal*. The Office of Noise Abatement has just begun its NOISE storage and retrieval system which will at a later date become part of the ENVIRON file now being established by the Office of Research and Monitoring. In addition, ENVIRON will contain the ongoing research projects file, the Oil and Hazardous Materials file and the Industrial Waste literature file. The Research Information Division within the Office of the Assistant Administrator for Research and Monitoring publishes the *Environmental Protection Research Catalog* and supports the Analytical Methodology Information Center, operated by Battelle Memorial Institute. AMIC input is included in the Water Resources Scientific Information Center's *Selected Water Resources Abstracts*. The Office of Solid Waste Management collects and processes literature for the Solid Waste Information Retrieval System. It publishes an abstract bulletin entitled, *Solid Waste Management, Abstracts from the Literature* and, as all other EPA information centers, bibliographies on areas of current interest. The Office of Water Programs maintains a data storage and retrieval system call STORET (Water Quality Technical Data and Information System). This system is accessible for input and retrieval in a number of EPA's field locations and state agencies.

Within the Department of Agriculture is a system for control of ongoing research projects, with many entries relating to aspects of environmental research. The system, known as the Current Research Information System, includes not only the department's research programs but also those of state experiment sections.

The Transportation Noise Research Information Service in the National Research Council, National Academy of Sciences, is a storage and retrieval system sponsored by the Department of Transportation.

The National Science Foundation sponsors the Environmental Information System and the Ecosystem Analysis Information Center-International Biological Program at Oak Ridge National Laboratory and cosponsors other centers at Oak Ridge with the Atomic Energy Commission.

The NASA's central Scientific and Technical Information Facility assembles worldwide research reports related to aeronautics and space. It abstracts

and indexes the material and publishes *Scientific and Technical Aerospace Reports (STAR)* and supports the publication of *International Aerospace Abstracts (IAA)*. The indexes materials are available from NTIS as well as the facility. NASA sponsored the development of the Aerospace Research Applications Center at the University of Indiana which has in turn developed the Environmental Systems Applications Center which concentrates on biological sciences, water and air pollution, law and environmental health.

The Smithsonian Institution has two data centers which deserve mention—the Center for Short-Lived Phenomena serving as an early alert system and clearinghouse for short-lived environmental pollution events, and the Flora North America Program concerning data on vascular plants of North America. The Smithsonian Institution's Science Information Exchange maintains a storage and retrieval system for ongoing research, including environmental research.

It can be argued, and probably rightly so, that government centers are set up and a series of information services begun before the need for such centers has been determined. This is true of outside services as well. Commercial indexing and abstracting services have often provided access to environmental information to the published literature, exclusive in most cases of government publications. Although these services are general in subject orientation, they do cover many of the same items now being indexed and abstracted by government and private specialized environmental information centers. NTIS provides the most general and centralized activity for the handling of government reports, yet there is coverage of many of the same items in other governmental, specialized information centers. In multi-disciplinary areas such as the environment it may be necessary to restructure coverage of the field as it is now carried out by the centers—government, private and commercial—in order to make maximum use of resources and at the same time to provide nonduplicative, more responsive systems to all segments of the user community.

### Libraries

Government libraries with sizeable collections in environmental subjects include the NAL, the NLM, the Natural Resources Library in DI, the libraries of the NIH, the FDA, the Bureau of Radiological Health (FDA), the NASA, the AEC, the Smithsonian Institution, the technical libraries of TVA, HUD, NOAA's Atmospheric Sciences Library and the Marine and Earth Sciences Library, and EPA's Library System. The Department of Commerce and DOT collections include valuable material in the subject area, but do not concentrate in it. Many of the departments have libraries in their regional offices which are often used as the first point of contact to the organization's library structure.

The National Agriculture Library publishes its catalog, *CAIN*, through the CCM Information Corporation. It does not contain abstracts but serves as a major guide to information on agriculture and its many related subject areas. The NAL's *Directory of Information Resources in Agriculture and Biology* serves as a referral tool for the library's own reference activities as well as for anyone outside the department.

*Index Medicus* is the NLM's printed catalog of its holdings, again with national and international coverage, in all areas of medicine and its related subjects. MEDLARS is the system designed by the National Library of Medicine to serve as a retrieval guide to worldwide medical literature. Again, like *CAIN*, it does not include abstracts but is probably one of the most comprehensive of all data books on medical literature. The on-line portion of MEDLARS, called MEDLINE, provides immediate access to medical information for users with terminal access. Both services provide access to a great deal of information relative to medical and health aspects of environmental pollution. The NLM, in addition to sponsoring the Toxicology Information Program, also publishes *Selected References on Environmental Quality As It Relates to Health* and the *Toxicity Bibliography*.

The catalog of the Natural Resources Library, published by G.K. Hall, represents a large collection of environmental literature. The library now issues an *Environmental Awareness Reading List* published through NTIS.

Other libraries with substantial holdings of environmental literature have or will be publishing their catalogs, either through such organizations as G.K. Hall or through their own publishing efforts.

EPA has issued its library systems *Journal Holdings List*, and is in the process of inputting records to the *Book Holdings File*, and is sponsoring the collection, processing and publication of an *EPA Reports Catalog* through NTIS. The holdings documents cover literature available in any of the thirty-seven libraries within the system. In cooperation with EPA's Office of International Activities it has just begun publishing *Summaries of Foreign Government Environmental Reports* to provide English abstracts of material received under the foreign literature exchange program.

## GENERAL DOCUMENT SERVICES AND REFERRAL CENTERS

In the environmental area, there are no specific document services and referral activities in the strictest definition. However, NTIS in the Department of Commerce has developed a number of special products and services for environmental literature. It now publishes a weekly current awareness service entitled *Environmental Pollution and Control*, which includes all new titles received from any source and a special section with coverage of new impact statements. The publication is arranged by the subcategories within the present category 68—environmental pollution and control—and includes abstracts

for all items. A committee is presently working with the NTIS to redefine category 68 to include aspects of the environment other than the air, water, noise and solid waste presently covered. The current awareness service picks up items relating to the environment, but not in the subject areas now covered in category 68, by a scheme of cross references to this category. The new category structure has been reviewed by many groups and is soon to be given to NTIS for use in categorizing, announcing and disseminating the literature received. In addition, NTIS has published a series of specialized bibliographies on aspects of the environment and publishes and distributes *Selected Water Resources Abstracts* for the WRSIC and the *Environmental Awareness Reading List* for DI. NTIS's *Government Reports Announcement* and its companion *GRI* include category 68 publications. Complete specifications and drawings of new patents from the priority program at the Patent Office are included in the subscription service from NTIS.

NASA's Scientific and Technical Information Facility indexes and abstracts literature related to its specific areas of concern but includes many items of interest to the environment. The *STAR* abstracting service is a guide to this material which may be obtained directly from the facility or through NTIS. The same situation exists for documents indexed in *Nuclear Science Abstracts* from the AEC's Technical Information Service in Oak Ridge. The Office of Education under its ERIC program has established the Science, Mathematics, and Environmental Education Information Analysis Center, which collects, abstracts, and indexes environmental education materials for input into central ERIC and *Research in Education*. The clearinghouse publishes the *SMEAC Newsletter*, serving as a supplementary specialized current awareness service to *Research in Education*. Items indexed in either of these services may be obtained from the ERIC Document Reproduction Service in Bethesda, Maryland.

The Superintendent of Documents publishes, distributes and sells many of the journals, indexing and abstracting services and individual reports issued in the environmental field by government organizations and their contractors. The Federal Depository Library Program provides some 1,074 libraries across the nation with government documents automatically and free of charge. Its "Price List 88 on Ecology" and the *Monthly Catalog of United States Government Publications* provide listings of items available for sale.

The National Referral Service at the Library of Congress handles requests from users and refers them to the appropriate organization when known. It publishes directories of information sources in various subject areas and although there is no directory specifically for environmental sources, there is one for Water Resources and the ones for Social Sciences and Physical Sciences include references to activities concerned with various aspects of the field.

The ORNL in Oak Ridge has begun development of a directory file in the environmental sciences and this is likely to be extended.

## PUBLICATIONS OF GOVERNMENT ORGANIZATIONS OTHER THAN INFORMATION PROGRAMS

In addition to the abstracting and indexing bulletins, special bibliographies and current awareness services discussed earlier, there are a number of special publications from various agencies which deserve mention. Two of these are published by CEQ on an annual basis and spell out the administration's policy and programs related to the environment. They are: *Environmental Quality, Annual Report of the Council on Environmental Quality* and the *President's Environmental Program*. The office of the federal coordinator of NOAA issues a *Federal Plan for Meteorological Services and Supporting Research*. Additional program review and policy and planning items include *Environmental Research and Development* issued by the Federal Council for Science and Technology's ad hoc committee on Environmental Quality Research and Development and the National Science Foundation's *Environmental Science—Challenge for the Seventies*.

The DOA's Yearbook series includes a number of titles specifically related to environmental concerns. EPA's Office of Research and Monitoring has published a two-volume directory of ongoing research projects entitled *Environmental Protection Research Catalog*, and the Office of Legislation has published a multi-volume compilation of *EPA Current Laws*. The EPA's Office of Radiation publishes *Radiological Health Data and Reports* and its Office of Solid Waste Management Programs publishes a *National Solid Waste Survey*. An important document relative to economics is the three-volume plus summary report entitled *The Economics of Clean Water* and a recent study entitled *Economic Impact of Pollution Control*.

NOAA's data centers publish annual catalogs of climatological, oceanographic and other data collected as part of its mission.

HEW issued a *Report of the Secretary's Commission on Pesticides and Their Relationship to Environmental Health* (often referred to as the MRAK Report) which has had a heavy impact on toxicology programs in NIH and EPA.

The Federal Power Commission's 1970 *National Power Survey* culminated a six-year study of the nation's power resources.

The U.S. Geological Survey has issued *Guidelines for Effective Impact Writing*, available from the assistant director for research.

An example of practical education tools is the *All Around You: An Environmental Study Guide* issued by DI's Bureau of Land Management. Additional titles from various offices are listed in appendix C.

Numerous other publications of equal significance are available from the departments and agencies discussed in an earlier section of this paper and from the U.S. Government Printing Office and NTIS.

## REFERENCE

1. *Congressional Record*. Aug. 6, 1971, p. E8971. (daily issue)

## APPENDIX A

### FEDERAL GOVERNMENT ENVIRONMENTAL ACTIVITIES

Council on Environmental Quality  
722 Jackson Place, N.W.  
Washington, D.C. 20006  
Information Office: 202-382-1415

Established by the National Environmental Policy Act of 1969 to formulate and recommend national policies for the promotion and improvement of the quality of the environment.

Environmental Protection Agency  
401 M Street, S.W.  
Washington, D.C. 20460  
Office of Public Affairs, Public  
Inquiries Branch: 202-755-0890

Reorganization Plan No. 3 of 1970 created the Agency to assure the protection of the environment by abating and controlling pollution on a systematic basis.

U.S. Department of Agriculture  
Washington, D.C. 20250  
Office of Information: 202-388-2791

a. Agricultural Research Service  
Assistant Secretary for Science  
and Education  
Information Division:  
202-388-4433

Established in 1953 to provide knowledge and technology for farmers to increase productivity, conserve the environment and meet food and fiber needs of the American people.

b. Agricultural Stabilization and  
Conservation Service  
Assistant Secretary for Inter-  
national Affairs and Commo-  
dity Programs  
Information Division: 202-388-5237

Established in 1961 to administer commodity and land use programs designed for voluntary adjustment and resource protection.

- c. Animal and Plant Health Inspection Service  
Assistant Secretary for Marketing and Consumer Services  
Information Division:  
202-388-3977
- d. Farmers Home Administration  
Assistant Secretary for Rural Development and Conservation  
Information Staff: 202-388-4323
- e. Forest Service  
Assistant Secretary for Rural Development and Conservation  
Division of Information and Education: 202-388-3760
- f. Soil Conservation Service  
Assistant Secretary for Rural Development and Conservation  
Information Division:  
202-388-4543

U.S. Department of Commerce  
Washington, D.C. 20230

- a. Maritime Administration  
Office of Public Affairs:  
202-967-2746
- b. National Bureau of Standards  
Special Assistant for Public Affairs: 301-921-3181
- c. National Industrial Pollution Council  
202-967-4513
- d. National Oceanic and Atmospheric Administration  
Office of Public Affairs:  
301-496-8910

Under Reorganization Plan No. 2 of 1972 the Service was charged with the conduct of regulatory and control programs to protect and improve animal and plant health for benefit of man and the environment.

Operates under Title V of the Housing Act of 1949, the Consolidated Farmers Home Administration Act of 1961, Title IIIA of the Economic Opportunity Act of 1964 to provide loans for soil and water conservation and watershed and flood prevention. Established in 1905 to manage federal forest reserves, improve the quality of air, water, soil, and natural beauty, and expand public understanding of environmental conservation.

Develop and carry out a national soil and water conservation program. Assists in agricultural pollution control, environmental improvement.

Created in 1913 to foster, serve and promote the Nation's economic development and technological advancement.

Engaged in research to eliminate all forms of marine pollution resulting from commercial ship operation and develop port reception facilities for shipboard wastes and oily ballast.

Established in 1901 to strengthen and advance the nation's science and technology and conduct research and provide a basis for the nation's physical measurement system.

Created in 1970 by Executive Order 11523 as a mechanism for industry and business to support pollution cleanup by industry.

Reorganization Plan No. 4 of 1970 set up NOAA to explore, map and chart the global oceans and translate new physical and biological know-

- e. National Technical Information Service  
703-321-8500

- f. Patent Office  
Commissioner of Patents:  
703-557-3080

U.S. Department of Defense  
The Pentagon  
Washington, D.C. 20301  
Directorate for Defense Informa-  
tion,  
Office of the Assistant Secre-  
tary of Defense (Public  
Affairs): 202-697-5131

- a. Department of the Army  
Army Environmental Hygiene  
Agency  
Army Mobility Equipment  
Research and Development  
Center

- b. Department of the Navy  
Deputy Undersecretary

- i. Judge Advocate General  
Public Affairs Officer:  
202-694-5021

- ii. Office of the Chief of Naval  
Operations

ledge into systems capable of assess-  
ing the sea's potential yield.

Established in 1970 to improve pub-  
lic access to the Department of Com-  
merce publications and to data files  
and scientific and technical reports  
produced by federal agencies and  
their contractors.

Environmental Patents Priority Pro-  
gram for the processing of applica-  
tions for patents which could curb  
environmental abuses.

Established by the National Security  
Act of 1947 to provide for the secur-  
ity of the U.S. An area coordinating  
paper on environmental quality is in  
a first draft stage and is expected to  
identify current work, point out over-  
lap and duplication if it exists, define  
gaps, and assist in the development of  
long-range programs.

Plans, reviews and directs the military  
and civil operations of the army in  
support of national policy and secur-  
ity. Environmental activities involve  
vehicle and mobile sources, bio-  
medical effects of noise and electro-  
magnetic radiation, air, water and  
solid waste disposal, and construction  
and facility operation.

Responsible for conduct of environ-  
mental protection program of the  
navy and marine corps and serves as  
focal point for department in esta-  
blishing policy in environmental  
affairs; reviews all navy and marine  
corps impact statements to CEQ.  
Areas of concern include ship waste  
management, oil spills and control,  
aircraft pollution abatement, ord-  
nance disposal and development of an  
environmental data base.

Provides legal services in regard to oil  
and gas law, the petroleum industry,  
conservation and environmental pro-  
tection.

Established in 1945 by Executive  
Order 9635.

Environmental Protection  
Division

- iii. Office of the Quartermaster  
General,  
Headquarters, U.S. Marine  
Corps  
Division of Information

Established in 1947 by the National Security Act; serves as focal point for major Marine Corps environmental programs.

c. Department of the Air Force

Aircraft and missile emission control, noise and sonic boom effects; electromagnetic effects; ground facility support; hazardous material handling; and evaluation and control of noxious effects in the atmosphere make up the environmental concerns of the air force research programs. Monitoring is carried out by the Air Weather Service; health aspects are a responsibility of the Environmental and Radiological Health Laboratories under the Surgeon General.

U.S. Department of Health, Education and Welfare, 330 Independence Ave., S.W., Washington, D.C. 20201  
Information Center: 202-962-2246

a. Food and Drug Administration

Established in 1931 by the Agriculture Appropriation Act and later transferred to the Department of Health, Education and Welfare. Concerned with the protection of the public health of the nation; including enforcement of pesticide regulations.

b. Bureau of Radiological Health

Under the Food and Drug Administration, its programs are designed to reduce exposure of man to hazardous ionizing and nonionizing radiation; develop standards for safe limits of radiation exposure; develop methodology for controlling radiation exposures; conduct research on the health effects of radiation exposure; and conducts an electronic product radiation control program.

c. National Institute of Environmental Health Services, Research Triangle Park, North Carolina 22709

Research on the biological effects of chemical, physical and biological substances present in the environment.

d. National Institute of Neurological Diseases and Stroke

Operates the Information Center for Hearing, Speech and Disorders of Human Communication which collects and disseminates information relating to noise and its effects on humans.

e. National Institute of Occupational Safety and Health

Concerned with air pollutants in industrial work environment, and noise pollution.

f. Office of Education

Established in 1867 to promote the cause of education, collect statistics to show condition and progress of education. Its Environmental Education Division performs the same activities relative to environmental education.

g. Health Services and Mental Health Administration,  
Bureau of Community Environmental Management

Concerned for the physical and social aspects of residential environments. Programs include control of lead-based paint poisoning, urban rat control, the Neighborhood Evaluation and Decision System (NEEDS), health aspects of housing, sanitation, Human Ecology Centers for special areas.

U.S. Department of Housing and Urban Development, 451 7th Street, S.W., Washington, D.C. 20410

Established in 1965 to assist in sound development of the nation's communities and metropolitan areas.

Program Information Center,  
Room 1202: 202-755-6420

a. Assistant Secretary for Community Development

Provides grants for basic water and sewer facilities and neighborhood facilities and loans for public facilities.

b. Assistant Secretary for Research and Technology

To improve land use; provide practical demonstrations of waste disposal systems; energy systems including the use of waste heat; noise abatement methods.

U.S. Department of Interior, C Street Between 18th and 19th Streets, N.W., Washington, D.C. 20240

Established in 1849, it is responsible for conservation and development of mineral and water resources; conservation, development utilization of fish and wildlife resources; improvement of the quality of the environment.

- a. Office of Oil and GAS (OOG)

Created in 1946 in response to a Presidential Letter to study the effects of oil and gas production, transportation, manufacturing and consumption on the environment; review environmental impact statements on oil and gas.
- b. Office of Saline Water (OSW)

Created in 1971 to conduct research and development for conversion from sea or other saline water, water suitable for agricultural, industrial, municipal and other beneficial uses.
- c. Office of Coal Research (OCR)

The Coal Research Act of 1960 established the office to provide research directed to developing methods of converting coal into clean alternative energy forms.
- d. Office of Water Resources Research (OWRR)  
Office of Information:  
202-345-4607

Responsible for the development of new technology and more efficient methods for resolving local, state and nationwide water resource problems; train water scientists and engineers; facilitate water research coordination and the application of research results by furnishing information on ongoing and completed research; operates a water resources scientific information center to furnish information to the nation's water resource community.
- e. United States Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife  
Conservation Education Office:  
202-343-5634

Improve and protect a quality environment for fish and wildlife resources to exist; study environmental impact statements and water use projects for probable effect on fish and wildlife resources; conserve estuaries and develop river basin plans; study pesticides effects.
- f. National Park Service

Protect natural environment of the areas; provide material to primary and secondary schools that integrate environmental concepts into the curriculum through the National Environmental Education Development (NEED) program; help teachers use a variety of sites for environmental studies through its National Environmental Study Areas (NESA) program.

- g. Bureau of Mines  
Office of Mineral Information:  
202-343-3590

Assessment of related social-economic factors; reduction of wastes; assurance that mineral raw materials are supplied and mineral-based products used and disposed of without objectionable social and environmental costs.

- h. U.S. Geological Survey (USGS)  
Information Officer: 202-343-4646

Established in 1879 to perform surveys; investigate and do research on topography, geology and water resources of the U.S.; insure maximum utilization and prevent waste of natural resources; limit environmental damage and pollution; coordinate federal water data acquisition activities through a national water data network; Earth Resources Observation Systems (EROS) which acquires and applies remote sensor data collected from aircraft and spacecraft toward solution of resources and environmental problems.

- i. Bureau of Land Management  
Office of Information:  
202-343-5717

Management of public lands, administers the mineral resources connected with acquired lands and submerged lands of outer continental shelf; provides for protection, orderly development, and use of resources under principles of multiple use and sustained yield, and for a quality environment; administers Johnny Horizon Environmental Program—an anti-litter, voluntary clean-up campaign for recreational areas.

- j. Bureau of Reclamation  
Commission of Reclamation:  
202-343-4662

Water quality improvement; conservation and utilization of water and related land resources including basin-wide water studies.

U.S. Department of Justice, Land  
and Natural Resources Division,  
Constitution Avenue and 10th  
Street, N.W., Washington, D.C.  
20530

Office of Public Information:  
202-737-8200

Established in 1870. Supervises all suits and matters of a civil nature in the federal district courts, in the state courts and in the court of claims relating to lands, water and other related natural resources and the outer continental shelf and marine resources and to the protection of the environment; responsible for criminal prosecutions for water and air pollution.

U.S. Department of State, 2201 C  
Street, N.W., Washington, D.C.  
20520

a. Bureau of International Scientific  
and Technological Affairs

Develops and directs carrying out of  
policy recommendations relative to  
peaceful uses of atomic energy in-  
cluding participation in the Inter-  
national Atomic Energy Agency; in-  
ternational cooperation and relation-  
ships in space, atmospheric and en-  
vironmental sciences.

b. Agency for International Develop-  
ment

Concerned with programs for the im-  
provement of the quality of the en-  
vironment in underdeveloped nations.

U.S. Department of Transportation,  
400 7th Street, S.W., Washington,  
D.C. 20590

a. Assistant Secretary for Environ-  
ment and Urban Systems:  
202-426-4563

Responsible for environmental and  
overall urban transportation needs,  
goals and policies; and for innovative  
approaches to urban transportation  
and environmental enhancement pro-  
grams.

b. Assistant Secretary for Systems  
Development and Technology:  
202-426-4552

Research into causes and effects of  
transportation noise and on noise  
abatement.

c. U.S. Coast Guard  
Commandant (WEP):  
202-426-2010

Is responsible for the Marine Environ-  
mental Protection Program aimed at  
the prevention, detection, and control  
of pollution on and adjacent to the  
navigable waters of the U.S.

d. Federal Highway Administration  
Office of Environmental Policy:  
202-426-0351

Concerned with the total operation  
and environment of the highway  
system; research program directed to  
effective design, costs, and social,  
economic, and environmental impact  
of highway transportation; programs  
on roadside development.

e. National Highway Traffic Safety  
Administration

Certifies as to consistency of EPA's  
state grants with any highway safety  
program.

f. Federal Aviation Administration,  
800 Independence Avenue, S.W.,  
Washington, D.C. 20590  
Office of Environmental Quality:  
202-426-8406

Programs relating to environmental  
quality in aircraft operation,  
including aircraft noise abatement,  
sonic boom, and smoke emission.

U.S. Department of Treasury, 15th  
Street and Pennsylvania Avenue,  
N.W., Washington, D.C. 20220

- a. Bureau of Customs  
Office of Public Information, 2100 K  
Street, N.W., Washington, D.C.  
20226  
202-964-8195

U.S. Atomic Energy Commission,  
Washington, D.C. 20545

- a. Oak Ridge National Laboratory,  
Oak Ridge, Tennessee

Delaware River Basin Commission,  
Room 5625, Department of  
Interior Building, Washington,  
D.C. 20240

Office of U.S. Commissioner:  
202-343-5761

District of Columbia, District  
Building, Pennsylvania Avenue  
and 14th Street, N.W.,  
Washington, D.C., Department  
of Environmental Services  
Public Affairs Officer: 202-629-2577

Federal Maritime Commission, 1405  
I Street, N.W., Washington, D.C.  
20573

Office of International Affairs and  
Relations: 202-382-4013

Federal Power Commission, GAO  
Building, 441 G Street, N.W.,  
Washington, D.C. 20426

Enforces environmental programs for  
other agencies such as prohibition on  
discharge of refuse and oil into or  
upon coastal navigable waters of U.S.  
(coast guard) as outlined in Oil Pollu-  
tion Act.

To assure that no deleterious quanti-  
ties of radioactivity are released into  
the environment, to study possible  
effects of releasing heated water into  
water systems; and develop methods  
for long-term disposal of radioactive  
wastes from nuclear operations.

Serves as a major contractor to the  
AEC in environmental research.

Projects and activities within Dela-  
ware River Basin related to abate-  
ment of stream pollution, soil conser-  
vation and watersheds.

Protecting residents of the District  
from effects of environmental pollu-  
tion.

Under Reorganization Plan No. 7 of  
1961, administers section 11 of the  
Water Quality Improvement Act of  
1970 with respect to evidence of fi-  
nancial responsibility by owners and  
operators of vessels which may be  
subjected to liability to the U.S. for  
the cost of removal of oil from the  
navigable waters of the U.S., adjoining  
shorelines, or waters of the con-  
tiguous zone.

Participates with other agencies in  
coordinating development and utiliza-  
tion of the nation's water and related  
land resources.

General Services Administration,  
8th and F Streets, N.W.,  
Washington, D.C. 20405

- a. Office of Environmental Affairs  
Executive Director: 202-343-4161

- b. Federal Supply Service

National Aeronautics and Space  
Administration, 400 Maryland  
Avenue, S.W., Washington, D.C.,  
20546

National Science Foundation, 1800  
G Street, N.W., Washington,  
D.C. 20550  
Assistant Director for Adminis-  
tration: 202-632-5710

Smithsonian Institution, 1000  
Jefferson Drive, S.W., Washing-  
ton, D.C. 20560

- a. Office of Environmental Sciences  
Office of the Undersecretary:  
202-381-5101

Environmental sciences and land use planning staff works in development of pioneering programs such as paper recycling; noise abatement and control; use of low gaseous fuels in automobiles; and elimination of environmental hazardous substances from GSA purchasing specifications.

Administers Dual-Fuel Project being conducted to determine if use of natural gas as an alternate fuel could significantly reduce harmful vehicle exhaust emissions; cooperates with EPA in testing vehicles converted to use of liquid petroleum.

Research programs include beneficial applications of space systems, the space environment, space related or derived technology. Programs include, as well the earth observations, meteorology; use of the space environment for materials sciences and processing; and the application of space-developed technology to domestic problems.

Research on unresolved scientific questions on fundamental life processes, natural laws and phenomena, fundamental processes influencing man's environment and the forces impacting on man as a member of society; research aimed at improving environmental quality.

Supports research and education concerned with ecological problems through its programs in ecology, oceanography and limnology. Ecological studies also done at Chesapeake Bay Center for Environmental studies—Center for Short-Lived Phenomena.

b. National Museum of Natural History

c. National Zoological Park

d. Smithsonian Astrophysical Observatory

e. Smithsonian Tropical Research

f. Woodrow Wilson International Center for Scholars

Tennessee Valley Authority, New Sprinkle Building, Knoxville, Tennessee 37902

Division of Environmental Research and Development, TVA, 713 Edney Building, Chattanooga, Tennessee 37401, and Wildlife Development, TVA, Norris, Tennessee 37828, as well as the Public Information Office, Knoxville, Tennessee 37902: 615-637-0101, ext. 2587

Citizens' Advisory Committee on Environmental Quality, 1700 Pennsylvania Avenue, N.W., Washington, D.C. 20006

National Science Foundation, 1800 G Street, N.W., Washington, D.C.

National problems of conservation and pollution, planning of national and international programs leading to predictive ecology and environmental management.

Research in ecology, conservation-oriented studies.

Conducts research in 12 areas, one of which is environment. A Central Bureau for Satellite Geodesy acts as an information exchange.

Devoted to study and support of tropical biology, education and conservation, focusing broadly on evolution patterns of behavior and ecological adaptations.

Environmental programs on an international level.

To conduct a unified program of resource conservation, development, and use.

Advise president and CEQ on matters effecting environmental quality.

Sponsors research related to environmental problems through its Research Applied to National Needs Program, Environmental Systems and Resources; its Foundation Research Directorate, Division of Environmental Sciences; and its Office of Science Information Service. COSATI (Council on Scientific and Technical Information) is now a part of the OSIS and its task forces are involved in many information programs from the

Federal Council for Science and  
Technology, Executive Office of  
the President, Washington, D.C.

Water Resources Council  
2120 L Street, N.W.,  
Washington, D.C. 20037  
202-254-6303

study and evaluation standpoint related to environmental sciences.

Performs studies and prepares reports and summaries of activities within the government related to science and technology, including information programs for the handling of these subjects. Particularly related to the areas of environmental concerns are the Ad Hoc Committee on Environmental Quality Research and Development, the Office of Science and Technology, and the Committee on Water Resources Research.

Established by the Water Resources Planning Act of 1965 to study adequate water supplies, administrative and statutory means for coordination of water and related land resources policies and programs. It reviews plans of river basin commissions; administers financial grants to states in comprehensive water and related land resources planning; establishes standards and encourages the conservation, development, and utilization of water and related land resources on a coordinated basis by federal, state and local governments and private enterprise. The council is composed of the Secretaries of Interior; Agriculture; Army; Health, Education and Welfare; Transportation; Chairman, Federal Power Commission; with participation by the Secretaries of Commerce; Housing and Urban Development; Attorney General; Administrator, Environmental Protection Agency; Council on Environmental Quality; River Basin Commissions; and Director, Office of Management and Budget.

Additional independent commissions and councils concerned with environmental areas include:

Migratory Bird Conservation Commission  
Department of Interior Building  
Washington, D.C. 20240

Mississippi River Commission  
Corps of Engineers, U.S. Army  
P.O. Box 80  
Vicksburg, Mississippi 39180

National Park Foundation  
Department of Interior Bldg.  
Washington, D.C. 20240  
National Water Commission  
800 N. Quincy Street  
Arlington, Virginia 22203

National Forest Reservation Commission  
1621 Kent Street  
Arlington, Virginia 22209

## APPENDIX B

### INFORMATION CENTERS AND SERVICES

#### *Department of Agriculture*

Current Research Information System  
(CRIS)  
Department of Agriculture  
12th and Independence Avenue, S.W.  
Room 6818, South Building  
Washington, D.C. 20250  
202-388-7273

#### *U.S. Atomic Energy Commission*

Ecological Information and Analysis  
Center (EIAC)  
Battelle Memorial Institute  
Columbus Laboratories  
505 King Avenue  
Columbus, Ohio 43201  
614-299-3151

Ecological Sciences Information Center  
Oak Ridge National Laboratory  
Oak Ridge, Tennessee 37830  
615-483-8611

Environmental Mutagens Information  
Center (EMIC)  
Biology Division  
Oak Ridge National Laboratory  
Post Office Box Y  
Oak Ridge, Tennessee 37830  
615-483-8611

Designed to provide research managers with up-to-date information on the total research programs of the Department of Agriculture, state agricultural experiment stations and other cooperating institutions.

Sponsored by the AEC to collect, store, retrieve, and evaluate information and data relevant to bioenvironmental and ecological studies, including mathematical modeling of ecosystems, population dynamics, bioenergetics, systems ecology, food-chain studies, and environmental aspects of air, water, and solid wastes pollution. Sponsored by the AEC to develop a base of ecological literature references and data that are relevant to the movement, cycling, and concentration of elements, isotopes, natural materials, and environmental pollutants in different ecosystems.

Sponsored by the AEC to collect information on the genetic effects of chemicals, including data on environmental pollutants, drugs, food additives, cosmetics and industrial chemicals.

Information Center for Internal  
Exposure

Health Physics Division  
Oak Ridge National Laboratory  
Post Office Box Y  
Oak Ridge, Tennessee 37830  
615-483-8611

Nuclear Safety Information Center  
(NSIC)

Oak Ridge National Laboratory  
Post Office Box Y  
Oak Ridge, Tennessee 37830  
615-483-8611, ext. 31165

Technical Information Center

Atomic Energy Commission  
Post Office Box 62  
Oak Ridge, Tennessee 37830  
615-483-4611

Environmental Information System

Oak Ridge National Laboratory  
Post Office Box X  
Oak Ridge, Tennessee 37830  
615-483-8611, ext. 36524

Nevada Applied Ecology Information  
Center

U.S. Atomic Energy Commission  
Nevada Operations Office  
P.O. Box 14100  
Las Vegas, Nevada 89114  
702-734-3715

*Department of Commerce*

Environmental Patent Priority Program  
Information

Office of Information Services  
Patent Office  
Washington, D.C. 20231  
202-557-3428

Sponsored by the AEC, the center analyzes information relevant to metabolic questions involved in estimating internal exposure.

The Nuclear Safety Information Center was established by the AEC as a focal point for the analysis of current information, production of state-of-the-art reports, and answering technical inquiries from U.S. government agencies and their contractors, research and educational institutions, and industry. Its Program and Project Information File (PPIF) contains information on all relevant research contracts.

The mission of the center is to collect, evaluate, organize, catalog and announce the international nuclear science literature and control, reproduce, and disseminate the report literature of the AEC and its contractors. Sponsored by the AEC and the NSF to conduct searches, answer questions, prepare reports and produce bibliographies using computer-based information largely derived from other sources on ecological sciences, material resources and recycling, environmental impact of electrical energy, and regional modeling.

Sponsored by the Atomic Energy Commission and the University of Nevada to consolidate sources of data on the bioenvironmental effects of nuclear testing.

Priority examination and processing of those patents claimed by their inventors to improve the air, water or soil.

Alloy Data Center (ADC)  
National Bureau of Standards  
Washington, D.C. 20234  
301-921-2917

Chemical Kinetics Information Center  
Physical Chemistry Division  
Institute for Materials Research  
National Bureau of Standards  
Washington, D.C. 20234

Chemical Thermodynamics Data Center  
Physical Chemistry Division  
Institute for Materials Research  
National Bureau of Standards  
Washington, D.C. 20234  
301-921-2773

Environmental Data Service  
National Oceanic and Atmospheric  
Administration  
Washington, D.C. 20235  
202-343-6226

Environmental Science Information  
Center

U.S. Department of Commerce  
National Oceanic and Atmospheric  
Administration

Environmental Data Service  
Rockville, Maryland 20852  
301-496-8236

National Climatic Center  
Environmental Data Service  
National Oceanic and Atmospheric  
Administration

Federal Building  
Asheville, North Carolina 28801  
704-254-0961

National Geophysical and Solar-  
Terrestrial Data Center  
National Oceanic and Atmospheric  
Administration

Boulder, Colorado 80302  
303-499-1000, ext. 6215

National Ocean Survey  
Oceanographic Division  
Office of Marine Surveys and Maps  
National Oceanic and Atmospheric  
Administration  
6001 Executive Boulevard

Under the National Standard Reference Data System (NSRDS), the ADC maintains interaction and awareness of data activity in the area of metals and alloys and their physical properties.

The mission of this center is to compile and disseminate specific kinetic data on the rates of homogeneous chemical reactions in gaseous, liquid and solid phases. It also includes photochemistry and inelastic scattering. The center is designed to provide and maintain self-consistent tables of "best" values of enthalpy and Gibbs free energy of formation, the entropy, heat capacity, and phase-change properties for chemical compounds.

Through its individual data and information centers, the Environmental Data Service supports NOAA's needs for information about the nation's physical world.

Serves as the focal point for the supervision of NOAA's scientific and technical information, documentation, publication and library activities, and for coordination with other government agencies, the scientific community and other national and international interests.

This center provides reach access to climatological data.

This center acquires, processes, stores, and disseminates geophysical data and develops analytical and descriptive products to meet user requirements.

The National Ocean Survey is designed to observe tides and tidal currents, to translate or digitize, reduce, analyze, compile, store and retrieve the data, and to predict tides and tidal currents.

Rockville, Maryland 20852  
 301-496-8274  
 National Meteorological Center  
 National Weather Service  
 National Oceanic and Atmospheric  
 Administration  
 FOB No. 4, Room 1302  
 Suitland, Maryland 20233  
 301-763-5817  
 National Oceanographic Data Center  
 (NODC)  
 National Oceanic and Atmospheric  
 Administration  
 U.S. Department of Commerce  
 Rockville, Maryland 20852  
 202-426-9061  
 World Data Center A, Oceanography  
 National Oceanographic Data Center  
 National Oceanic and Atmospheric  
 Administration  
 U.S. Department of Commerce  
 Rockville, Maryland 20852  
 202-426-9052

#### *Department of Defense*

Environmental Technical Applications  
 Center  
 U.S. Air Force  
 Building 159  
 Navy Yard Annex  
 Washington, D.C. 20333  
 202-433-3901  
 Engineer Agency for Resources  
 Inventories (EARI)  
 Directorate of Military Engineering  
 U.S. Army Corps of Engineers  
 4701 Sangamore Road  
 Washington, D.C. 20016  
 202-227-2535  
 Environmental Hygiene Agency  
 Preventive Medicine Division  
 Professional Service Directorate  
 Office of the Surgeon General  
 U.S. Army  
 Edgewood Arsenal, Maryland 21010  
 301-671-4315

The prime function of this center is the analysis and prediction of air pollution potential.

NODC collects, processes and disseminates oceanographic data (geological, biological and physical properties of the sea water).

World Data Center A, Oceanography, is one of nine U.S. located discipline-oriented subcenters of the World Data Center (WDC) System. It conducts international exchange of data and publications in accordance with guidelines set forth by the International Council of Scientific Unions and the Intergovernmental Oceanographic Commission.

Provides centralized capability to collect, store, retrieve, process and analyze environmental data for publication, planning, and technical applications required by DOD, army, air force and authorized contractors.

Provides environmental planning documents.

The agency accumulates, evaluates, stores and disseminates toxicologic and environmental pollution data for use by the Surgeon General and other Department of the Army staff offices and agencies directed toward army pollution abatement.

Environmental Protection Data Base  
Program  
Department of the Navy  
Naval Civil Engineering Laboratory  
Naval Facilities Engineering Command  
(NAVFAC)  
Port Hueneme, California 93041  
805-982-5336

*Environmental Protection Agency*  
Air Pollution Technical Information  
Center  
U.S. Environmental Protection  
Agency  
Research Triangle Park, N.C. 27711  
919-549-8411, ext. 2131  
919-549-2131 (FTS System)  
Publications and Information Section  
Office of Pesticides Programs  
U.S. Environmental Protection Agency  
Technical Services Division  
4770 Buford Highway  
Chamblee, Georgia 30341  
404-633-3311  
Analytical Methodology Information  
Center (AMIC)  
Battelle Memorial Institute  
Columbus Laboratories  
505 King Avenue  
Columbus, Ohio 43201  
614-299-8045

National Air Data Branch  
Office of Air Programs  
U.S. Environmental Protection Agency  
Mutual Building  
Durham, North Carolina 27701  
919-688-8146, ext. 261  
Noise Information Retrieval System  
Office of Noise Abatement and Control  
U.S. Environmental Protection Agency  
Washington, D.C. 20460  
202-254-7400  
Program Information Branch  
Research Information Division  
Office of Research and Monitoring

The EPDBP calls for a thorough investigation and evaluation, showing the extent the environment is affected by ships, aircraft and shore installations.

Collects and disseminates technical information related to air pollution; publishes *Air Pollution Abstracts* and provides cover-to-cover translations of foreign journals in the field.

Provides technical information on pesticides and their effects on health to all divisions in the Office of Pesticide Programs, other EPA offices and outside groups.

AMIC's mission is to acquire, index and abstract literature related to analytical methods. It publishes a monthly awareness bulletin, responds to special requests for evaluated information on specific topics, and serves as a center of competence for the Water Resources Scientific Information Center. AMIC is sponsored by the Office of Research and Monitoring, U.S. EPA.

Collects and processes air pollution data, analyzes for trends and meaningful results, publishes and disseminates air pollution information.

Information system on noise pollution and control.

Provides technical information for the planning, programming and budgeting of the research and monitoring pro-

U.S. Environmental Protection  
Agency  
Washington, D.C. 20460  
202-755-0638

Solid Waste Information Retrieval  
System (SWIRS)  
Office of Solid Waste Management  
Programs  
U.S. Environmental Protection  
Agency  
1835 K Street, N.W.  
Washington, D.C. 20460  
202-254-7507

Water Quality Technical Data and  
Information System (STORET)  
Office of Water Programs  
U.S. Environmental Protection  
Agency  
Washington, D.C. 20460  
703-557-7446

*Health, Education and Welfare*

Office of Technical Information  
Bureau of Radiological Health  
Food and Drug Administration  
Department of Health, Education  
and Welfare  
1901 Chapman Avenue  
Rockville, Maryland 20852  
301-443-3434

Carcinogenesis Bioassay Data System  
National Cancer Institute  
National Institutes of Health  
Department of Health, Education  
and Welfare  
Building 37, Room 3A-23  
Bethesda, Maryland 20014  
301-496-5593

Information Storage and Referral  
Section  
National Institute of Environmental  
Health Sciences  
National Institutes of Health  
Department of Health, Education  
and Welfare  
P.O. Box 12233

gram; provides records of ongoing and completed in-house research and monitoring contract and grant projects and insures final reports thereon; provides a project reports system which is now part of ENVIRON (Environmental Information Retrieval On Line).

SWIRS organizes for quick retrieval the published information concerning current research and technological developments in the solid waste management field throughout the world.

The system, using computer technology, provides for the collection, storage, retrieval, and analysis of water quality data and other pollution control information.

Collects and retrieves significant literature dealing with x-rays, particle accelerators, electronic product radiation, radium and other radioactive materials, radiation biological effects and standards and recommendations related to radiological health.

A computer system for the accumulation, storage, analysis, and retrieval of selected information generated by the Carcinogenesis Bioassay Program; provides for publication of the results of literature survey in the field of carcinogenesis (chronological continuation of the series "Compounds Which Have Been Tested for Carcinogenic Activity") and the *Carcinogenesis Abstracts*.

Provides information primarily internally to the Institute's Scientific Directorate for Program Planning, to the Office of Scientific Information and Communications (OSIC) for preparing state-of-the-art reports, and the intramural scientists for their research.

Research Triangle Park, N.C. 27711  
919-549-8411

National Library of Medicine  
National Institutes of Health  
Public Health Service  
Department of Health, Education  
and Welfare

8600 Rockville Pike  
Bethesda, Maryland 20014  
301-496-6217

Toxicology Information Programs  
National Library of Medicine  
National Institutes of Health  
Public Health Service  
Department of Health, Education  
and Welfare

8600 Rockville Pike  
Bethesda, Maryland 20014  
301-496-3147

Toxicology Information Response  
Center (TIRC)

Oak Ridge National Laboratory  
Post Office Box X  
Oak Ridge, Tennessee 37830  
615-483-5533

Technical Information Service Branch  
Division of Technical Services  
National Institute for Occupational  
Safety and Health

Public Health Service  
Department of Health, Education  
and Welfare

1014 Broadway  
Cincinnati, Ohio 45202  
513-684-2693

Science, Mathematics, and Environ-  
mental Education Information  
and Analysis Center (SMEAC)

Subject index to the periodical litera-  
ture of medicine and related fields  
published as *Index Medicus* and re-  
tained on computer files for retrieval  
purposes.

The Toxicology Information Pro-  
grams established an on-line inter-  
active retrieval system (TOXICON)  
containing information and data on  
hazards to man from pesticides, other  
environmental and occupational tox-  
icants, and drugs. It collects such data  
from the literature and the files of  
cooperating industrial and govern-  
ment agencies; sponsors the publica-  
tion of state-of-the-art reviews in tox-  
icology; and, through a Toxicology  
Information Response Center, per-  
forms information analysis and refer-  
ence services in toxicology for the  
scientific community.

Sponsored by the Toxicology Infor-  
mation Programs, National Library of  
Medicine, to perform literature  
searches in toxicology on demand for  
the scientific community; to prepare  
or sponsor state-of-the-art reviews in  
toxicology and to publish these in  
journals or as monographs; to create  
computerized data bases in environ-  
mental and drug toxicology.

Dissemination of scientific and tech-  
nical information on occupational  
safety and health, including toxicity  
of chemicals and health hazards en-  
countered in the work environment.

Indexes and abstracts literature on  
environmental education for input to  
central ERIC; publishes newsletter.

ERIC Information Analysis Center  
1460 West Lane Avenue  
Columbus, Ohio 43210  
614-422-6717

*Department of the Interior*  
Division of Technical Reports  
Office of Mineral Information  
Bureau of Mines  
U.S. Department of the Interior  
Washington, D.C. 20240  
703-557-0320

Engineering Reference Branch  
Bureau of Reclamation  
Office of Design and Construction  
U.S. Department of the Interior  
Engineering and Research Center  
Denver Federal Center, Building 67  
Denver, Colorado 80225  
303-234-3022

Division of Planning and Research  
Outdoor Recreation Research  
Register  
Bureau of Outdoor Recreation  
U.S. Department of the Interior  
Washington, D.C. 20240  
202-343-5754

Eutrophication Information Program  
University of Wisconsin  
Water Resources Center  
1324 West Dayton Street  
Madison, Wisconsin 53706  
608-262-3577

EROS Data Center  
10th and Dakota Avenue  
Sioux Falls, South Dakota 57198  
605-339-2270

Disseminates as expeditiously as possible the results of its findings from inquiries and scientific and technologic investigations concerning mining and the preparation, treatment and utilization of mineral substances with a view to improving health conditions, and increasing safety, efficiency, economic development, and conserving resources through the prevention of waste in the mining, quarrying, metallurgical, and other mineral industries.

Acquires, indexes, abstracts, stores, retrieves, and disseminates information concerning all phases of water resources research and development.

Assembles descriptions of currently active or recently completed outdoor recreation and related environmental research projects.

Provides search, referral, and information services in eutrophication and related aspects of the aging or maturing of lakes, reservoirs, and other inland bodies of water. Sponsored by DI's Office of Water Resources Research, EPA and USDA.

Provides access to Earth Resources Technology Satellite imagery, USGS aerial photography, and NASA aircraft data for the general public, domestic government agencies, and foreign governments. Sponsored by the U.S. Geological Survey of the DI.

National Water Data Program  
Water Resources Division  
U.S. Geological Survey  
U.S. Department of the Interior  
Washington, D.C. 20242  
202-343-9425

Office of Saline Water Information  
Program

U.S. Department of the Interior  
Washington, D.C. 20240  
202-343-6992

Water Resources Scientific Infor-  
mation Center (WRSIC)

Office of Water Resources Research  
U.S. Department of the Interior  
Washington, D.C. 20240  
202-343-8435

Southern Water Resources  
Scientific Information Center  
2111 D.H. Hill Library  
North Carolina State University  
P.O. Box 5007  
Raleigh, North Carolina 27607  
919-755-2683 or -2839

Water Resources Information Program  
University of Wisconsin  
1324 West Dayton Street  
Madison, Wisconsin 53706  
608-262-7980

*National Aeronautics and Space Administration*

NASA Scientific and Technical  
Information System  
Office of Industry Affairs and  
Technology Utilization  
Code KS

Washington, D.C. 20546  
301-779-2121, ext. 646

Aerospace Research Applications  
Center (ARAC)  
Indiana University  
400 E. Seventh Street  
Bloomington, Indiana 47401  
812-337-7833

Coordinates water data acquisition activities by federal agencies and the development of a National Water Data System.

Publishes and disseminates technical information relating to desalting technology.

Disseminates scientific and technical information to the national water resources community.

Provides retrieval services to scientists, engineers, administrators, planners, and others concerned with research, planning, problem-solving, and decision-making vital to the conservation and utilization of the water resources of the region. Sponsored by the Water Resources Scientific Information Center, Department of the Interior.

Sponsored by the Water Resources Scientific Information Center, the program expedites the exchange of information in the area of water resources.

Collects, processes, stores and retrieves technical information and data related to aeronautics and space on a worldwide basis.

Sponsored by NASA, this center provides basic scientific and technical information on closed ecological systems, materials handling, measurements and control technology, physical and biological effects, waste treatment and recycling.

Environmental Systems Applications  
Center

Poplars Research and Conference  
Center

Indiana University  
Bloomington, Indiana 47401  
812-337-8260

*National Science Foundation*

Ecosystem Analysis Information  
Center

International Biological Program  
Oak Ridge National Laboratory  
Oak Ridge, Tennessee 37830  
615-483-8611

*Smithsonian Institution*

Smithsonian Science Information  
Exchange

1730 M Street, N.W., Suite 300  
Washington, D.C. 20036  
202-381-5700

Center for Short-Lived Phenomena  
Office of Environmental Sciences  
Smithsonian Institution  
60 Garden Street  
Cambridge, Mass. 02138  
617-864-7911

Flora North America Program  
Department of Botany  
Smithsonian Institution  
Washington, D.C. 20560  
202-381-5801

*Department of Transportation*

Transportation Noise Research  
Information Service

Highway Research Board  
National Research Council  
National Academy of Sciences  
2101 Constitution Avenue, N.W.  
Washington, D.C. 20418

ESAC is sponsored by NASA to provide a variety of computerized literature searching services on biological sciences, water and air pollution, environmental health, economics, law and administrative regulations.

Sponsored by the NSF to provide data and mathematical modeling for the Eastern Deciduous Forest Biome Project and publish an abstract journal for five biome programs, including the Western Coniferous Forest, Grassland, Desert, and Tundra Biome Programs.

Subsidiary of the Smithsonian Institution for dissemination of information concerning research in progress.

Serves as an early alert system and clearinghouse for information on major short-lived environmental pollution events and sudden changes in biological and ecological systems.

Cosponsored by the Smithsonian and the National Science Foundation to provide information systems development and data banks concerned with the vascular plants of North America.

Sponsored by the Department of Transportation to develop and operate a storage and retrieval system for transportation noise research information.

APPENDIX C  
ENVIRONMENTAL LIBRARIES:  
GENERAL DOCUMENT AND REFERRAL SERVICES

Defense Documentation Center (DDC) Cameron Station Alexandria, Virginia 22314 202-274-6800	Mrs. Eleanor Tracey U.S. Environmental Protection Agency Region II Field Office Library Edison, New Jersey 08817 201-548-3347, ext. 520
Mrs. Ruth Seidman U.S. Environmental Protection Agency Region I Library 240 Highland Avenue Needham Heights, Mass. 02194 617-223-7265	Mrs. Estelle K. Cohen, Librarian U.S. Environmental Protection Agency New York Product Analysis Laboratory 201 Varick Street New York, N.Y. 10014 212-620-3474
Miss Rose Ann Gamache, Librarian U.S. Environmental Protection Agency National Marine Water Quality Laboratory P.O. Box 277 West Kingston, Rhode Island 02892 401-789-9751	Ms. Pauline Levin U.S. Environmental Protection Agency Region III Library Curtis Bldg., 6th & Walnut Streets Philadelphia, Pennsylvania 19106 215-597-0580
Ms. Ann K. Gottlieb U.S. Environmental Protection Agency Region II Library 26 Federal Plaza New York, N.Y. 10007 212-264-4092	Miss Sarah M. Thomas U.S. Environmental Protection Agency Headquarters Library Room 2903, Waterside Mall Washington, D.C. 20460 202-755-0353
Mrs. Margaret S. Mason U.S. Environmental Protection Agency Region III Field Office Library Annapolis Science Center Annapolis, Maryland 21401 301-268-5038	Mrs. Susan W. Bass, Librarian Instructional Resource Center Manpower Development Staff Office of Air Programs National Environmental Research Center U.S. Environmental Protection Agency Research Triangle Park, N.C. 27711 919-549-8411, ext. 2401
Mrs. Harriet J. Myers Reference Library Office of Administration National Environmental Research Center U.S. Environmental Protection Agency Research Triangle Park, N.C. 27711 919-549-8411, ext. 2104	Mrs. Vida Hartfield, Librarian U.S. Environmental Protection Agency Gulf Coast Water Supply Laboratory P.O. Box 158 Dauphin Island, Alabama 36528 205-861-2962
Mr. Rychard S. Cook, II U.S. Environmental Protection Agency Perrine Primate Laboratory Library P.O. Box 470 Perrine, Florida 33157 305-350-2219	Ms. Rachel Reed, Librarian Stationary Source Pollution Control Program Office of Air Programs U.S. Environmental Protection Agency National Environmental Research Center Research Triangle Park, N.C. 27711 919-688-8146

Mrs. Charlotte Folk, Librarian  
U.S. Environmental Protection Agency  
Southeast Water Laboratory  
Athens, Georgia 30601  
404-546-3103

Mr. Norman E. Childs  
U.S. Environmental Protection Agency  
Eastern Environmental Radiation Lab  
P.O. Box 61  
Montgomery, Alabama 36101  
205-272-3402

Mrs. Juanita P. Jones, Librarian  
Division of Meteorology  
U.S. Environmental Protection Agency  
National Environmental Research Center  
Research Triangle Park, N.C. 27711  
919-549-8411, ext. 4536

Miss Wave E. Culver, Librarian  
Division of Health Effects Research  
U.S. Environmental Protection Agency  
National Environmental Research Center  
Research Triangle Park, N.C. 27711  
919-549-8411, ext. 2321

Mrs. Claudia B. Lewis  
Publications and Information Section  
Division of Pesticides Community Studies  
U.S. Environmental Protection Agency  
4770 Buford Highway  
Chamblee, Georgia 30341  
404-633-3311

Ms. Lorene Fuller  
U.S. Environmental Protection Agency  
Robert S. Kerr Environmental Research  
Lab  
P.O. Box 1198  
Ada, Oklahoma 74820  
405-332-8800

Ms. Bernadine E. Hoduski  
U.S. Environmental Protection Agency  
Region VII Library  
1735 Baltimore Avenue, Room 249  
Kansas City, Missouri 64108  
816-374-5828

Ms. Ann Woodhouse  
U.S. Environmental Protection Agency  
National Field Investigation Center  
Room A-1209, Building 53  
Denver Federal Center  
Denver, Colorado 80225  
303-234-2122

Mrs. Ann Valmus, Librarian  
U.S. Environmental Protection Agency  
Gulf Breeze Laboratory  
Sabine Island, Building 29  
Gulf Breeze, Florida 32561  
904-932-5326

Mrs. Lou W. Tilley  
U.S. Environmental Protection Agency  
Region V Library  
1 North Wacker Drive  
Chicago, Illinois 60606  
312-353-3399

Mrs. Mary J. Lewis, Librarian  
U.S. Environmental Protection Agency  
National Water Quality Laboratory  
6201 Congdon Boulevard  
Duluth, Minnesota 55804  
218-727-6692

Mr. Morton H. Friedman  
U.S. Environmental Protection Agency  
Library  
National Environmental Research Center  
Cincinnati, Ohio 45268  
513-871-1820, ext. 492

Miss Dee Crawford  
U.S. Environmental Protection Agency  
Region VI Library  
1600 Patterson Street  
Dallas, Texas 75201  
214-749-2007

Mrs. Doreen Wickman  
U.S. Environmental Protection Agency  
National Environmental Research Center  
P.O. Box 15027  
Las Vegas, Nevada 89114  
702-736-2969

Ms. Arvella Weir  
U.S. Environmental Protection Agency  
Region X Library  
1200 Sixth Avenue  
Seattle, Washington 98101  
206-442-1289

Ms. Betty McCauley  
U.S. Environmental Protection Agency  
National Environmental Research Center  
200 S.W. 35th Street  
Corvallis, Oregon 97330  
503-752-4346

- Mrs. Jean Circiello  
U.S. Environmental Protection Agency  
Region IX Library  
100 California Street  
San Francisco, California 94111  
415-556-4527
- Miss Ruby Gill  
U.S. Environmental Protection Agency  
Solid Waste Information Retrieval System  
Library, Room 631  
1835 K Street, N.W.  
Washington, D.C. 20460  
202-254-7506
- Housing and Urban Development Library  
Department of Housing and Urban Development  
7th and D Streets, S.W.  
Washington, D.C. 20410  
202-755-6376
- The Library of Congress  
National Referral Center  
Science and Technology Division  
Washington, D.C. 20540  
202-426-5682
- National Agricultural Library  
U.S. Department of Agriculture  
Beltsville, Maryland 20705  
301-344-3779
- National Library of Medicine  
Department of Health, Education and Welfare  
8600 Rockville Pike  
Bethesda, Maryland 20014  
301-656-4084
- Radiological Health Library  
Bureau of Radiological Health  
Food and Drug Administration  
12720 Twinbrook Parkway  
Rockville, Maryland 20857  
301-443-1038
- Technical Library  
Tennessee Valley Authority  
500 Union Avenue  
Knoxville, Tennessee 37902  
(administers TVA technical libraries  
in Knoxville, Tenn.; Chattanooga,  
Tenn.; Muscle Shoals, Alabama)  
615-637-101
- Ms. E. Agnes Young, Librarian  
Wenatchee Research Station  
U.S. Environmental Protection Agency  
P.O. Box 73  
Wenatchee, Washington 98801  
509-663-8331
- National Oceanic and Atmospheric  
Administration  
Atmospheric Sciences Library  
8060-13th Street  
Silver Spring, Maryland 20910  
301-495-2405
- National Oceanic and Atmospheric  
Administration  
Marine and Earth Sciences Library  
6001 Executive Boulevard  
Rockville, Maryland 20852  
301-496-8021
- National Technical Information Services  
(two locations)  
U.S. Department of Commerce  
14th and Constitution Avenue, N.W.  
Washington, D.C. 20230  
202-967-3227
- National Technical Information Service  
5285 Port Royal Road  
Springfield, Virginia 22151  
703-321-8500
- Natural Resources Library  
U.S. Department of the Interior  
19th and C Streets, N.W.  
Washington, D.C. 20240  
202-343-5821
- Smithsonian Institution Libraries  
Natural History Building  
10th and Constitution Avenue, N.W.  
Washington, D.C. 20560  
202-381-5421

## APPENDIX D

## SAMPLE LISTING OF GOVERNMENT ENVIRONMENTAL PUBLICATIONS

## Department of Agriculture

*Current Available Publications and Prices*, List No. 5.

*Titles, Prices and Sources of Filmstrip and Slide Sets*, AF 1107 (available from the Photography Division, Office of Information)

## National Agricultural Library:

*Agricultural/Biological Vocabulary, Thesaurus*, 1967

*CAIN (Cataloging and Indexing) System Tapes*

*Directory of Information Resources in Agriculture and Biology*

*National Agricultural Library Catalog*, published by a commercial publisher from camera-ready copy by the NAL

## Atomic Energy Commission

Nuclear Safety Information Center, Oak Ridge National Laboratory:

*Nuclear Safety* (journal)

Technical Information Center, Oak Ridge, Tennessee:

*AEC Combined Film Catalog* (with category on environment and ecology)

*Engineering Materials List*

*Informal Listing of Bibliographies of Atomic Energy Literature*

*Nuclear Science Abstracts*

## Department of Commerce

Business Service Checklist periodically lists publications of the department

National Bureau of Standards:

*Directory of Federally Supported Information Analysis Centers*

National Oceanic and Atmospheric Administration:

*Annual Catalogs* from the various data centers

*Federal Plan for Meteorological Services and Supporting Research* (Office of the Federal Coordinator)

National Technical Information Service:

*Government Reports Announcements (GRA)—Abstract Bulletin*

*Environmental Pollution and Control*, weekly current awareness service

Patent Office:

*Official Gazette*, including abstracts of patents covered in the priority program

## Council on Environmental Quality

*Environmental Quality, Annual Report*

*President's Environmental Program*, annually

The following microeconomic studies prepared for the CEQ, Department of Commerce and EPA:

1. Booz Allen Public Administration, Inc., *Microeconomic Study of Pollution Cost Abatement from Steel Making*, prepared for the Council on Environmental Quality, Department of Commerce and Environmental Protection Agency, 1972.

2. The Boston Consulting Group, *Microeconomic Study of Pollution Cost Abatement from Cement Manufacturers*, prepared for the Council on Environmental Quality, Department of Commerce and Environmental Protection Agency, 1972

3. Charles River Associates, Inc., *Microeconomic Study of Pollution Cost Abatement from Nonferrous Metals Smelting and Refining*, prepared for the Council on Environmental Quality, Department of Commerce and Environmental Protection Agency, 1972

4. Dunlap and Associates, Inc., *Microeconomic Study of Pollution Cost Abatement from Fruit and Vegetable Canning and Freezing*, prepared for the Council on Environmental Quality, Department of Commerce and Environmental Protection Agency, 1972

5. Ernst and Ernst, *Microeconomic Study of Pollution Cost Abatement from Baking*, prepared for the Council on Environmental Quality, Department of Commerce and Environmental Protection Agency, 1972

6. A. T. Kearney and Company, Inc., *Microeconomic Study of Pollution Cost Abatement from Iron Foundries*, prepared for the Council on Environmental Quality, Department of Commerce and Environmental Protection Agency, 1972

7. A. D. Little, Inc., *Microeconomic Study of Pollution Cost Abatement from Pulp and Paper Mills*, prepared for the Council on Environmental Quality, Department of Commerce and Environmental Protection Agency, 1972

8. National Economic Research Associates, Inc., *Microeconomic Study of Pollution Cost Abatement from Electric Power Generation*, prepared for the Council on Environmental Quality, Department of Commerce and Environmental Protection Agency, 1972

9. Stephan Sobotka and Company, *Microeconomic Study of Pollution Cost Abatement from Petroleum Refineries*, prepared for the Council on Environmental Quality, Department of Commerce and Environmental Protection Agency, 1972

10. Urban Systems Research and Engineering, *Microeconomic Study of Pollution Cost Abatement from Leather Tanning*, prepared for the Council on Environmental Quality, Department of Commerce and Environmental Protection Agency, 1972

U.S. Congress, House of Representatives, Committee on Science and Astronautics.

*Environmental Science Centers at Institutions of Higher Education*, a survey prepared for the Subcommittee on Science, Research, and Development by the Environmental Policy Division, Legislative Reference Service, Library of Congress, December 15, 1969

Defense Documentation Center

*Technical Abstract Bulletin*, much of the environmentally related material abstracted here is for sale through the National Technical Information Service

U.S. Environmental Protection Agency

*Compilation of Air Pollutant Emission Factors* revised, Feb. 1972

*The Economics of Clean Air*, report of the Administrator to the U.S. Congress, 92nd Congress, 1st Session, Document No. 92-6, March 16, 1971

Office of Air Programs:

*Air Pollution Abstracts*, Air Pollution Technical Information Center

*APTIC Bibliography Series*, Air Pollution Technical Information Center

Office of Pesticides Programs:

*Health Aspects of Pesticides Abstract Bulletin*

*Pesticides Monitoring Journal*

## Office of Radiation:

*Background Material for the Development of Radiation Standards*, Report No. 2, September 1969, (published by the Federal Radiation Council, now a part of EPA, but one of the standards in the field)

*Radiological Health Data and Reports*

## Office of Solid Waste Management:

*Abstracts of Solid Waste Patents**National Solid Waste Survey*

*Solid Waste Management: A List of Available Literature*, from the Solid Waste Information Retrieval Service

*Solid Waste Management, Abstracts from the Literature*, from the Solid Waste Information Retrieval Service

*Summaries of Solid Waste Management Contracts*, Office of Solid Waste Management

*SWIRS Accession Bulletin*, Solid Waste Information Retrieval Service

## Federal Council for Science and Technology

*Ad Hoc Committee on Environmental Quality Research and Development:*

*Environmental Quality Research and Development* (available from GPO)

## Federal Power Commission

*1970 National Power Survey*, a six-year study

## Department of Health, Education and Welfare

*The Cost of Clean Air*, Second Report of the Secretary of Health, Education and Welfare to the U.S. Congress, 91st Congress, 2nd Session, Document no. 91-65, March 1970

*Report of the Secretary's Commission on Pesticides and Their Relationship to Environmental Health*, (MRAK Report) December 1969

## National Institutes of Health:

## National Cancer Institute:

*Carcinogenesis Bioassay Data System*

*Carcinogenesis Abstracts*

## National Library of Medicine:

*Index Medicus*

*Selected References on Environmental Quality as It Relates to Health Toxicity Bibliography*

## National Library of Medicine, Toxicology Information Program:

*Abstracts on the Health Effects of Environmental Pollutants* (HEEP)

*Index to the Report of the Secretary's Commission on Pesticides and Their Relationship to Environmental Health*, from GPO

## Office of Education:

*Newsletter*, distributed from SMEAC; items indexed appear in *Research in Education*

## Department of the Interior

*It's Your World*

*Man—an Endangered Species?*

*Our Living Land*

*The Population Challenge*

*Quest for Quality*

*River of Life—Water, the Environmental Challenge*

*The Third Wave*

Eutrophication Information Program, Water Resources Center:

*Eutrophication Abstracts*

Bureau of Land Management:

*All Around You; an Environmental Study Guide "How to" Booklet*,  
Johnny Horizon

*The Last Frontier*, film from Booking Exchange, Association-Sterling  
Films, 866 Third Avenue, New York, New York 10022

*We've Got a Lot of Work to Do*, film from Johnny Horizon Program

Geological Survey:

*Catalog of Information on Water Data*, from National Water Data Pro-  
gram

*Guidelines for Effective Impact Writing* from Assistant Director for  
Research

*Publications of the Geological Survey*, from GPO

Natural Resources Library:

*Listing of Bibliographies compiled by the Library*, available from the  
Information Services Division, Office of Library Services

National Park Service:

*Price List No. 35* from GPO

*List of Films* from Harpers Ferry Historical Association, P.O. Box 147,  
Harpers Ferry, West Virginia 25425

Office of Water Resources Research, Water Resources

Scientific Information Center:

*Selected Water Resources Abstracts*

*Water Resources Research Catalog*, done by SIE under contract to  
WRSIC

*WRSIC Bibliography Services*, special areas of water pollution, pesticides,  
detergents, agricultural run-off and urbanization

National Aeronautics and Space Administration

*International Aerospace Abstracts*, (IAA), in conjunction with the Associa-  
tion of Scientific and Technical Aerospace Reports (STAR) Aeronautics  
and Astronautics

National Audiovisual Center, General Services Administration

*Film Catalog*

National Science Foundation

*Environmental Science—Challenge for the Seventies*

Office of the President

Office of Science and Technology:

*Protecting the World Environment in Light of Population Increases*

President's Science Advisory Committee:

*Handling of Toxicological Information, Report of the Committee*, 1966.

The Toxicology Information Program at the National Library of  
Medicine was established to implement its recommendations.

## APPENDIX E

### ENVIRONMENTAL DIRECTORIES AND HANDBOOKS

- ASIDIC Survey of Information Center Services.* Informal publication.
- Complete Handbook on Environmental Control; A Reference Manual.* Thomas B. McClain & David Zarefsky, Skokie, Illinois, National Textbook, Co., 1970.
- Conservation Directory 1972.* Washington, D.C. National Wildlife Federation, 1972.
- A Description of the Directory of Environmental Information Sources.* ORNL-NSF Environmental Program. U.S. Atomic Energy Commission. Z. Combs, D.K. Trubey & J.R. Buchanan, Oct. 1971.
- Directory of Consumer Protection and Environmental Agencies.* Academic Media, 32 Lincoln Avenue, Orange, N.J. 07050.
- Directory of Environmental Information Sources.* 2d ed. National Foundation for Environmental Control. Thibeau & Taliaferro, eds. 151 Tremont Street, Boston, Mass. 02111.
- Directory of Environmental Officials in Chemical Engineering, Deskbook Issue.* Environmental Engineering. McGraw Hill Publication, May 8, 1972, pp. 27-36.
- Directory of Federally Supported Information Analysis Centers (COSATI-70-1, PB 189300).* Prepared by Committee on Scientific and Technical Information, Federal Council for Science Technology, Jan. 1970.
- Directory of Governmental Air Pollution Agencies.* Air Pollution Control Association. U.S.G.P.O.
- Directory of Information Resources in Agriculture and Biology.* National Agricultural Library, Beltsville, Md., U.S. Dept. of Agriculture, 1971.
- Directory of Information Resources in the United States: General Toxicology, A.* National Referral Center for Science and Technology. Washington, D.C., Library of Congress, U.S.G.P.O.
- Directory of Information Resources in the United States: Physical Sciences, Biological Sciences, Engineering, A.* National Referral Center for Science and Technology. Washington, D.C., Library of Congress, U.S.G.P.O.
- Directory of Information Resources in the United States: Social Sciences, A.* National Referral Center for Science and Technology. Washington, D.C., Library of Congress, U.S.G.P.O.
- Directory of Information Resources in the United States: Water National Referral Center for Science and Technology.* Washington, D.C., Library of Congress, U.S.G.P.O.
- Directory of Organizations Concerned with Environmental Research.* Mordy and Sholtys, eds. Fredonia, N.Y., Lake Erie Environmental Agency, State University College.
- Directory of Selected Specialized Information Services (CONF 651131).* Ad Hoc Forum of Scientific and Technical Information Analysis Center Managers, Directors, and Professional Analysis, Nov. 1965.
- Directory of USAEC Information Analysis Centers (Ecology and Environmental Quality Bibliography).* Syracuse, N.Y., Syracuse University Library, Jan. 1972.

- Environmental Engineering Directory in Chemical Engineering, Deskbook Issue.* Environmental Engineering, McGraw-Hill, May 8, 1972, pp. 161-224.
- Environmental Planning: A Selected Annotated Bibliography.* Michael J. Meshenberg. Chicago, Illinois, American Society of Planning Officials.
- Environmental Science Centers at Institutions of Higher Education.* A survey prepared by the Environmental Policy Division, Legislative Reference Service, Library of Congress for the Subcommittee on Science, Research, and Development, Committee on Science and Astronautics, U.S. House of Representatives, 91st Congress, First Session, Washington, D.C., U.S.G.P.O., Dec. 15, 1969.
- A Golden Guide to Environmental Organizations.* Bruce W. Halstead, comp. New York, Golden Press, 1962.
- Information Resources in Pesticides: Environmental Health and Hazardous Materials.* EPA, Hazardous Materials Advisory Committee.
- A Resource Guide on Pollution Control: Federal, State and Local Agencies That Deal with Environmental Problems.* American Association of University Women, 1970.
- SEQUIP Study of Environmental Quality Information Programs.* SEQUIP Committee Directory. (Rev. ed. draft)
- Survey of Scientific-Technical Tape Services.* Ed. by Kenneth D. Carroll. American Institute of Physics, American Society for Information Science.
- Yell-O Pages; Environmental Resources.* Environmental Resources, Inc.

## APPENDIX F USER CONTACTS

### *National Water Resources Data System*

WRITE: Chief Hydrologist  
Water Resources Division  
U.S. Geological Survey  
Washington, D.C. 20242

CALL: 202-343-9425 (commercial & FTS\*)

### *Earth Resources Observation System (EROS) Data Center*

WRITE: EROS Data Center  
Data Management Branch  
10th & Dakota Avenue  
Sioux Falls, South Dakota 57198

(Address all correspondence concerning EROS data user training courses to Mr. Donald Kulow, Training Officer)

CALL: 605-339-2270 (commercial)  
605-336-2381 (FTS)  
(7:00 A.M. - 7:00 P.M. Central Time)

\*Federal Telecommunications Division

*National Water Quality Control Information System (STORET)*

WRITE: C. S. Conger  
Chief, Information Access  
and User Assistance Branch  
Room 928, C.M. 2  
Environmental Protection Agency  
Washington, D.C. 20460

CALL: 703-557-7617 (commercial)

*National Air Data Branch (SAROAD & NEDS)*

WRITE: J. R. Hamorle, Chief  
National Air Data Branch  
Monitoring and Data Evaluation  
Division  
Office of Air Quality Planning  
and Standards  
Environmental Protection Agency  
Research Triangle Park, N.C. 27709

CALL: 919-688-8110 (commercial)

*National Space Science Data Center (NSSDC)*

WRITE: National Space Science Data  
Center  
Goddard Space Flight Center  
Code 601  
Greenbelt, Maryland 20771

CALL: 301-982-6659 (commercial)

*National Climatic Center (NCC)*

WRITE: The National Climatic Center  
National Oceanic and  
Atmospheric Administration  
Federal Building  
Asheville, North Carolina 28801

CALL: 704-254-0961 Ext. 683 (commercial)  
704-254-0683 (FTS)

(Residents of the Washington, D.C. areas may call NCC directly and toll-free by dialing—no area code required—495-2424)

*National Oceanographic Data Center (NODC)*

WRITE: The National Oceanographic  
Data Center  
National Oceanic and  
Atmospheric Administration  
Rockville, Maryland 20852

CALL: 202-426-9044 (commercial)

VISIT: NODC is located in the Washington Navy Yard at 2nd and M Streets, Southeast, Building 160, Washington, D.C.

*National Geophysical and Solar-Terrestrial Data Center (NGSDC)*

Most of the NGSDC activities are located at 30th and Marine Streets, Boulder, Colo. The marine geology and geophysics group, however, is located at 2001 Wisconsin Avenue, N.W., Washington, D.C.

WRITE: Director  
Environmental Data Service D6

NOAA  
Boulder, Colo. 80302  
CALL: 303-499-1000 Ext. 6215  
(commercial & FTS)  
WRITE: Environmental Data Service DF62  
NOAA  
Washington, D.C. 20007  
CALL: 202-343-7368 (commercial & FTS)

APPENDIX G  
EARTH RESOURCES SURVEY PROGRAM  
BROWSE FILE LOCATIONS

*U.S. Department of Agriculture*

Utah

Western Aerial Photography Laboratory  
2505 Parley's Way  
Salt Lake City, Utah 84109

*U.S. Department of Commerce*

Alaska

National Weather Service Alaskan Region  
632 6th Avenue  
Anchorage, Alaska 99501

California

Director, Southwest Fisheries Center  
8604 La Jolla Shores  
La Jolla, California 92037  
Marine Mineral Technology Center  
3150 Paradise Drive  
Tiburon, California 94920

Colorado

Aeronomy and Space Data Center  
Radio Building No. 3  
Boulder, Colorado 80302

Florida

Atlantic Oceanographic and Meteorological  
Laboratories  
15 Rickenbacker Causeway  
Virginia Key  
Miami, Florida 33149

Hawaii

National Weather Service Pacific Region  
Bethel-Paushi Building  
1149 Bethel Street  
Honolulu, Hawaii 96813

## Maryland

National Environmental Satellite  
Service (ESG)  
Suite 300  
3737 Branch Avenue  
Hillcrest Heights, Maryland 20031  
National Ocean Survey C3413  
6001 Executive Blvd.  
Rockville, Maryland 20852  
National Oceanographic Data Center  
6001 Executive Boulevard  
Rockville, Maryland 20852  
Atmospheric Sciences Library D821  
8060 13th Street (Room 802)  
Silver Spring, Maryland 20910

## Massachusetts

Director, Northeast Fisheries Center  
P.O. Box 6  
Woods Hole, Massachusetts 02543

## Michigan

Lake Survey Center CLx13  
630 Federal Bldg. & U.S. Courthouse  
Detroit, Michigan 48226

## Missouri

National Weather Service Central Region  
601 E. 12th Street, Room 1836  
Kansas City, Missouri 64106

## New York

National Weather Service Eastern Region  
585 Stewart Avenue  
Garden City, New York 11530

## North Carolina

National Climatic Center  
Federal Building  
Asheville, North Carolina 28801

## Oklahoma

National Severe Storms Laboratory  
1616 Halley Avenue  
Norman, Oklahoma 73069

## Texas

Office of Sea Grant  
Center for Marine Resources  
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## Information Resources in Environmental Sciences: An Academic Viewpoint

The environment is just slightly larger than the earth and is comprised of the planet, with a gross weight of  $5.88 \times 10^{21}$  tons, a diameter of 7,900 miles, a surface of  $197 \times 10^6$  square miles, and a 10-mile thin skin, the troposphere, which is the site of clouds, rain, weather, and air pollution. From an anthropomorphic view, "spaceship earth" voyages through the solar system with a cargo of  $3.6 \times 10^9$  humans and an associated million odd species of plants and animals inhabiting the 57 million square miles of land surface and the 330 million cubic miles of lakes and oceans. In this context, the human environment has been defined as the aggregate of all social, biological, and physical or chemical factors which comprise the surroundings of man.

In dealing with so vast a subject matter, some limitations must be applied: the term "environmental science" has been defined as basic and applied inquiry about changes in environmental quality resulting from the activities of man.<sup>1</sup> For this discussion, the subject matter of environmental science is comprised of the chemical, physical, and biological changes in the environment through contamination or modification; the chemical nature and biological behavior of air, water, soil, food, and waste as they are affected by man's agricultural, industrial, and social activities; and the application of the natural sciences and technology together with the social sciences and law to

control and improve environmental quality. Even under these limitations, the scope of environmental science demands a large share of the world's informational resources.

Deterioration of environmental quality started at an unknown date in antiquity when primitive man began to collect into villages and to utilize fire. However, environmental pollution has existed as a serious problem only since the industrial revolution which began with the invention of the steam engine by Watt in 1769 and the spinning jenny by Hargreaves in 1770. During the intervening 200 years, the exploitation of fossil fuels has provided the energy resources to support a world population increase from about 850 million to 3.6 billion. This rate of population growth can be supported only by increasing industrial and technological progress and it is now apparent that the more materialistic a society becomes, the greater the impact on the quality of the environment. U.S. society today has entered into an era picturesquely described by *Time* magazine as the "age of effluence."

Concern over environmental quality has become a major preoccupation in the United States only since the phenomenal industrial growth following World War II. The scientific and technological dimensions of environmental quality were first outlined in the 1965 President's Science Advisory Committee report, "Restoring the Quality of Our Environment,"<sup>2</sup> and the scope of the environmental quality movement as a popular crusade took shape with student involvement in 1969. The ultimate spread to global dimensions began with the June 1972 United Nations Conference in Stockholm on the human environment, where more than 1,400 participants from 113 countries approved a Declaration on the Human Environment and endorsed more than 100 proposals of an environmental action plan. (For a report on this conference see Anglemeyer's paper in this volume.) Clearly, things will never be the same again and the world has embarked upon an environmental quality movement whose ultimate dimensions can scarcely be imagined. Environmental science is destined to play a decisive role in the human future.

## ROLE OF ACADEMIC INSTITUTIONS

Academic institutions will play a very special role in the future study and evaluation of the problems of the quality of the total environment. These problems are often extremely complex and their definition generally lies beyond the scope of any single discipline. The development of significant information leading to feasible solutions for these problems will require the collaborative efforts of interdisciplinary teams of specialists working together in a problem-oriented atmosphere, each contributing his expertise to the multi-faceted inspection of the problem. In effect we are describing a sort of super agricultural experiment station, that creation of the land grant college system

which has so successfully helped develop the U.S. agricultural technology that the farmer who in 1850 fed four persons, now feeds forty. This very model for the mobilization of the resources of higher education has been recommended by Steinhart and Cherniack in *The Universities and Environmental Quality—Commitment to Problem Focused Education* in a report to the President's Environmental Quality Council. They recommended "*That the Federal Government assist in the formation at colleges and universities of Schools of the Human Environment.*"<sup>3</sup>

### Support and Funding of University Programs

The age of concern for environmental quality arrived at a time when academic institutions were experiencing extraordinary budgetary stringencies. The recession of the late 1960s affected not only federal and state funds but also private donors, and was accompanied by public disenchantment with the aims and goals of higher education. Thus the establishment of environmental institutes which promised to be large and costly was fraught with difficulties. There was great competition for already scarce funds between existing departments and colleges, and faculty and administrators were suspicious that then new institutes would preempt both areas of study and funds for growth. There was also a long faculty tradition of individual scholarly effort and consequent misunderstanding of multi-disciplinary and interdisciplinary modes of inquiry.

Fortunately for progress in the environmental age, certain farsighted sources of support materialized. University administrations have been unusually supportive both in the physical establishment of new environmental institutes and in providing the framework for their operation. A variety of new programs in federal agencies, private foundations, and state governments have provided at least the bare bones of support for the new institutes. The National Science Foundation has been responsive to the goals of "Restoring the Quality of Our Environment" and established its first program in this area under the IRRPOS program of 1970. This was the outgrowth of a 1968 amendment to the NSF charter to include applied research in its purview. The initial funding of the University of Illinois program for the study of lead in the total environment originated in this program. With increasing emphasis on problem-oriented research and long term societal needs, NSF created the RANN program in March 1971 to include the IRRPOS projects and other established NSF programs. About 75 percent of the \$56 million available for RANN projects in 1972 was devoted to university programs. The RANN program encompasses four major divisions: (1) advanced technology applications—e.g., the earthquake engineering program of the University of Illinois; (2) environmental systems and resources—e.g., the program on environmental pollution by lead and other metals at the University of Illinois; (3) social

systems and human resources; and (4) exploratory research and problem assessment.

Another major source of encouragement and funding has been the Environmental Quality Program of the Rockefeller Foundation. This was established in 1969 and has as its objective the establishment of major centers of expertise in key environmental areas at universities. The Rockefeller program has supported a program on nitrogen as an environmental determinant in the College of Agriculture at the University of Illinois; and a program on development of novel, selective, and nonpersistent insecticides.

The Illinois Institute for Environmental Quality, an arm of the state government, has many aims in common with the University of Illinois Environmental Studies Program and has supported a number of projects including preparation of monographs on *A Study of Environmental Pollution by Lead*<sup>4</sup> and *Chemistry and Biology of Trace Metals in the Environment*.<sup>5</sup>

The physical model developed by most universities to meet the challenges of environmental quality is an environmental studies institute, institute of environmental quality, or a similar title.<sup>6</sup> Most of the large land grant institutions in the U.S. have now formed such organizations. The Environmental Studies Institute of the University of Illinois, which has been underway since 1968, seems reasonably typical of these institutes, and its structure and aims will be described briefly. The institute encompasses the same scope of activities as its parent, the University of Illinois, i.e., teaching, research, and direct service to society. The mission of the institute "is to expand and transfer knowledge with increased emphasis on problem-solving uses of the knowledge . . . and included the extension of the educational experiences of the student through internship in industry or government and the dissemination of information gained from research to decision makers in industry and government."<sup>7</sup>

### Research Components

The heart of the research program is a group of interdisciplinary and multidisciplinary task forces which will work on problems of broad social significance such as "environmental pollution by lead and other metals," "overcrowding of cities and its psychological and biological consequences," "nitrogen as an environmental determinant—technical, social, and economic considerations," "environmental consequences of the use of agricultural chemicals" and "world population evaluation and control."<sup>8</sup>

The mission of the task force on environmental pollution by lead and other metals in the environment provides an example of the research function of the Environmental Studies Institute. This task force has been supported by NSF grants totalling about \$1,200,000 under the IRRPOS and RANN

programs. The objective is to determine the movements and effects of heavy metals in the environment. Initial emphasis was placed on lead because of the enormous industrial usage in the U.S. Lead is presently consumed at the rate of 1.4 million tons annually in the United States with 19.5 percent as tetraethyl antiknock fluid burned in the engines of 105 million motor vehicles. This lead is emitted from the exhausts of these vehicles as an aerosol of lead chlorobromide and permeates the physical environment of all our cities and the lungs of all our urban dwellers. Cantarow and Trumper have described lead as the most important toxic hazard incident to the development of modern civilization.<sup>9</sup> Lead poisoning in young children in urban slums is a major source of brain damage, mental deficiency, and serious behavior problems<sup>10</sup> and it has been estimated that as many as 250,000 U.S. children have seriously elevated blood levels. In Chicago in 1966 there were 304 serious cases of childhood lead poisoning with five deaths. Recent surveys have shown substantial numbers of elevated blood levels in children in other Illinois cities.

Because of the increasing utilization of lead in industry and of tetraethyl lead in motor vehicles, which is increasing at about 5 percent per year, the lead levels in urban air are slowly increasing and ever larger amounts of lead are deposited in cities and along highways. Bellrose estimated that for all species of waterfowl in North America, the annual loss to lead poisoning, mostly from ingested shot, was between 2 and 3 percent of the population.<sup>11</sup> Thus the study of the total ecology of lead in the environment is an important facet of environmental sciences. Because of the key role of tetraethyl lead in the performance of the high compression gasoline engine and the sensitivity of catalytic smog prevention devices to lead poisoning, the removal of lead as a gasoline additive is a complex economic problem and it has been estimated that lead free gasoline will cost 2 to 4 cents more per gallon. The problem of lead in the environment therefore provides an exceptional opportunity to study the broad social interactions between economic, sociological, political, legal, and public health interrelations posed by society's attempt to correct a classic pollution problem.

The University of Illinois lead project is a truly interdisciplinary research effort involving seventy research workers in twelve departments. The basic emphasis is on mass transport in the terrestrial ecosystem and upon effects on plants and animals. A geographic area bounded by routes I-74 and U.S.45 and incorporating Brownfield Woods and the Saline Ditch is being used for input-output, for soil storage measurement, and for evaluation of plant and animal effects; physical measurements are also being made of this area. Extensive systems modeling and analysis is developing a complete model for transport of lead in the environment—where it goes, how much is located in various environmental components, evaluation of effects, prediction of future

transports, and suggestion of effects that might occur due to changing the major sources of lead in the environment. The model will be evaluated by correlating it with the field data collected. The ultimate aim of the project is to gain understanding of the behavior of heavy metals in the environment, to evaluate alternatives for pollution control, and to develop an effective university organization for management of an interdisciplinary study of societal impact, to achieve both short-range goals and long-range contributions to human knowledge.

### **Educational Component**

It is envisioned that the "on campus" educational program of the institute should include aspects of both graduate and undergraduate education. Formal courses should deal with the principles of environmental quality control, holistic concepts of environmental management, and social values applicable to the environment. Existing courses in other departments of the university will be used to the greatest extent commensurate with the interdisciplinary problem-oriented nature of the total educational problem in environmental studies.

Large scale emphasis is already being given to environmental education within the University of Illinois. On the Urbana-Champaign campus, 150 formal courses, out of a total of more than 5,500, deal specifically with environmental quality. These are presently conducted in the departments of agricultural economics, agronomy, anthropology, architecture, atmospheric sciences, biochemistry, biology, botany, business administration, chemistry, civil engineering, communications, computer science, economics, education, entomology, forestry, general engineering, geography, geology, industrial engineering, landscape architecture, law, library science, mechanical engineering, microbiology, physiology, political science, psychology, recreation and park administration, sociology, urban and regional planning, veterinary medicine, and zoology.

The Center for Human Ecology is incorporated into the Environmental Studies Institute and will become its educational arm. Existing courses in human ecology will be reinforced by others which will stress the holistic concepts of problem-solving. Existing courses in other departments will be crosslisted to develop sound and innovative educational programs. Students will be encouraged to participate in one or more task force programs as part of their educational experience. Every effort will be made to meet the programs of the institute with other developing curricula such as ecology, environmental engineering, and environmental law.

## Public Service Component

The public service function of the Environmental Studies Institute is especially important because of the social relevance of its programs, and will be aimed at two levels: a consultative service to federal, state, or local governmental units, and a comprehensive program of public education and advice to citizens groups and individuals. It will include an editorial and publication staff whose function will be to translate research results into documents promoting the application of research results. Above all it will seek to build a three-way interchange between the information and research resources of the university, governmental agencies with their needs for expertise in the environmental science area, and the general public whose education and interpretive needs in the environmental quality area must become increasingly urgent because of the rapidly intensifying problems of human ecology.

## REQUISITE LIBRARY RESOURCES

The magnitude of the environment, the urgency of environmental quality problems, and the extent of involvement of academic institutions in their study and solution, all pose challenges to the existing informational and library resources. It is axiomatic that academic institutions can neither serve their educational, research, and public service functions without extensive support from libraries, nor succeed in these functions without developing vast amounts of new information which libraries must hold, catalog, and make accessible to an ever-widening clientele. Although a thorough discussion of these problems is the total subject of this volume, a few remarks about specific problems are in order here. Again, observations will be restricted to the University of Illinois, Urbana-Champaign.

### Research Resources

The interdisciplinary and multi-disciplinary modes of environmental sciences make extraordinary demands on the university research worker and his team and upon the libraries that serve them. The research and background information needed for successful environmental sciences studies such as air pollution, water pollution, noise pollution, pesticides and the environment, urban planning, land use allocation or human population control, covers many disciplines and demands access to books and journals from a wide variety of classical disciplines. These cannot be categorized readily into conventional library branches such as agriculture, biology, chemistry, engineering, geology, law, and medicine. The average research publication in *Environmental Sciences*

Areas of Emphasis	Total	Number Founded After	
		1965	1970
Air pollution	8	5	0
Conservation	26	5	1
Ecology	11	1	3
Environmental design	4	2	2
Environmental engineering	9	2	2
Environmental health	11	2	1
Environmental law	5	0	5
Environmental sciences—general	24	7	13
Environmental toxicology	14	1	2
Marine pollution	7	1	1
Water pollution	10	1	0
Wildlife	8	2	1
Environmental sciences reviews	8	1	3
Environmental sciences abstracts, biblio- ographies, indices	20	4	7
Totals	165	34	41

Table 1. Areas of Emphasis, Numbers of Journals, and Dates of Origin  
for Periodicals in the Environmental Sciences

*and Technology* cites fourteen references and the average review article in *Advances in Environmental Science and Technology* cites seventy-nine references. These are largely journals and monographs with a considerable international flavor. Their variety and disciplinary diversity has to be seen to be believed. In addition, because of the very rapidly developing character of information in this area there is unusually heavy reliance upon reports from state and federal agencies, the National Academy of Sciences, and other paperback reports not commonly prized by librarians and not easily located in most libraries. The problem of collecting, preserving, and identifying this large source of information is a crucial one for environmental science library resources.

The data in table 1 are offered as an illustration of the problems involved in providing library resources in the environmental sciences and the problem of the reader in locating them. In the University of Illinois library, we have selected a list of 165 readily identifiable English-language periodicals

relating to environmental sciences. These have been further classified into areas of emphasis such as air pollution, water pollution, conservation, ecology, toxicology, etc. These journals form the backbone of an environmental sciences collection and their number and diversity is substantial. The rate at which new periodicals are being published is interesting. Since the dawn of the environmental age in 1965, seventy-four new periodicals have appeared, representing 45 percent of the collection, and the rate seems to continue unabated. The information on beginning publication dates is indicative of the old well-established fields such as conservation, ecology, environmental health, environmental toxicology, marine and water pollution, and wildlife where the most important journals were established many years ago, as contrasted with new fields such as air pollution, environmental design, environmental engineering and environmental law. It is clear from this information that environmental sciences as a general subject has developed almost entirely since 1965 and is still developing very rapidly.

The number of journals, the rapid appearance of important new ones, and the steady increase in price index per volume, from \$8.02 in 1967 to \$11.66 in 1971<sup>12</sup> all highlight the problems of university libraries as they seek to serve the environmental sciences area.

### **Environmental Sciences Branch Libraries**

As new areas of technological concentration develop, the problems of library classification and accessibility proliferate. Agricultural sciences libraries developed in land grant colleges in response to large scale demands for broad scale coverage of technological information relating to basic disciplines such as biology and chemistry together with developing applied sciences such as agronomy, entomology, forestry, horticulture, plant pathology, soil science and toxicology. The environmental sciences pose new dimensions for library resources at least an order of magnitude greater, involving economics, engineering, geography, law, sociology, and psychology among others. The germinal question therefore becomes: Is there need for a branch library in environmental sciences? From two viewpoints, that of the Environmental Studies Institute and that of the individual teacher and researcher in the environmental sciences, the answer is a qualified yes. From the viewpoint of the library scientist we are less certain. Table 2 shows information from the University of Illinois library on the location of files of twenty-five important journals which we have arbitrarily selected as important basics to environmental sciences. These are located in twelve branch libraries scattered over two square miles of campus and the geographical barrier obviously becomes an important one.

<i>Periodicals</i>	<i>Call Numbers</i>	<i>Location</i>
Air Quality Data	614.71	ENG, CPLA
Archives of Environmental Health	613.05	BIOL
Bulletin of Environmental Con- tamination and Toxicology	632.405	NHS, ENG
Environment and Behavior	309.2605	CPLA, MAP
Environmental Design and Research	711.01	CPLA
Environmental Engineering	613.105	ENG
Environmental Health Series:		
Air Pollution	614.71	ENG, CPLA
Environmental Health Series:		
Food Protection	614.3	HOME ECON
Environmental Health Series:		
Radiological Health	614.715	ENG, VET MED
Environmental Health Series: Urban & Industrial Health	614	ENG
Environmental Health Series: Water Supply and Pollution Control	614.772	ENG
Environmental Law	614.705	LAW, CPLA
Environmental Pollution	614.705	CHEM, BIOL
Environmental Science and Technology	614.705	ENG, CHEM, NHS GEOL SUR, AGR
Human Ecology	301.305	BIOL
J. of Air Pollution Control Assoc.	614.7105	ENG
J. of Environmental Education	301.305	PE
J. of Environ. Health	614.05	BIOL
J. of Environmental Quality	630.5	CPLA
J. of Environmental Sciences	620.5	ENG
J. on Human Ecology	301.305	BIOL
J. of Water Pollution Control Federation	628.05	ENG
Pesticides Monitoring Journal	614.7705	AGR
Water and Sewage Works	628	ENG, NHS
Water and Wastes Engineering	628.05	ENG

Table 2. Campus Location of 25 Important Periodicals in  
Environmental Sciences

## THE FUTURE

Just as the vast preponderance of technical literature about agricultural sciences originates in land grant colleges, it seems reasonable to predict that

these same institutions, together with their proliferating more youthful offspring—the other institutions of higher learning—will produce the major portion of the technical literature about environmental sciences. That information in this area will develop from its present trickle to a flood can scarcely be doubted. Most of the great problems of human ecology and environmental quality lie ahead and are illuminated in a provocative book *The Limits to Growth*<sup>13</sup> which should be required reading for all those with professional interests in the environmental sciences. This book presents the results of a study by the Club of Rome—"Project on the Predicament of Mankind"—utilizing a global model of system dynamics developed by Jay Forrester of M.I.T., to examine on a global scale the interrelations among the five basic factors that determine growth on earth: population, agricultural production, natural resources, industrial production, and pollution. The study concludes that unless an early global equilibrium is established among these factors (within twenty to fifty years), declining resources, the population explosion, food shortages, and pollution will contribute to a major collapse of civilization within the time span indicated. Many reasonable people and in particular technological enthusiasts may quarrel with the grim picture presented. Only those grossly ignorant of the implication of exponential growth in world population, in pollution, and in rate of resource depletion, will dismiss the conclusions as those of "irresponsible environmentalists." However, it cannot be doubted that early warning signals are already at hand. The nearly intolerable conditions in the inner cities of the megalopoli (e.g., the problems of refuse disposal in New York City), the ravages of air pollution in the Los Angeles Basin (e.g., the sudden death of several million ponderosa pines in the San Bernardino National Forest), the impending energy crisis in the United States (featured in *Scientific American*, *National Geographic*, *Saturday Review*, *Time*, *Newsweek*, etc.), and the starvation of millions in Bangladesh—all these are but straws in the wind of the immense technological, social, and political revolution to be involved in the future of human ecology. The United States, which already consumes 44 percent of the world's coal, 33 percent of its petroleum, 63 percent of its natural gas, 28 percent of its iron, 38 percent of its nickel, 42 percent of its aluminum, 33 percent of its copper, 25 percent of its lead, 24 percent of its mercury, and about 40 percent of its available electric power—to service only 6 percent of the total global population—cannot escape tremendous technological changes as the irresistible trend toward global equilibrium continues. Information resources in the environmental sciences are crucial to both the education of the citizens, to the problems lying just ahead, and to the support of the technological revolution in the offing.

<i>Year</i>	<i>Gross National Product (billions of dollars)</i>	<i>Books Published</i>
1950	\$ 284.8	11,022
1955	398.0	12,589
1960	503.7	15,012
1965	684.9	28,595
1969	931.4	29,579
1970	976.5	36,071

Source: U.S. Department of Commerce, *Statistical Abstract*, 1971.

**Table 3. Gross National Product of the United States and the Production of Books**

### Effects on Information Resources

There is an interesting and perhaps predictable relation between gross national product and publication of books and journals. In the U.S. the parallel is astonishingly exact, both quantities following almost identical curves (table 3). This relationship is exact enough and has the appropriate rationality to permit some interesting extrapolations. The GNP in 1970 was \$976.5 billion and the average price of a hardcover book was \$11.66.<sup>14</sup> The ratio of these two interdependent values suggests that each hardcover book is based upon \$27 million of GNP. In 1970, 13,448 of the 36,071 books published (37 percent) were in areas pertaining to environmental sciences. Extrapolations of the U.S. GNP to 2000 A.D. suggest a value of \$1,920 billion or approximately double the 1970 value and at least a consequent doubling of the number of relevant technological books to about 27,000 yearly.

Another useful yardstick for prediction of the growth of information resources in the environmental sciences is the extent to which capital funds will be directed toward improving environmental quality. Two figures are available: the recent action of Congress in appropriating \$24.6 billion, over President Nixon's veto, for the Clean Water Act which aims to end water pollution by 1985, and the estimate by the U.S. Council on Environmental Quality of \$105 billion to be spent by 1975 for a partial clean-up of American air, water and solid waste pollution.<sup>15</sup> At the previously established ratio of \$27 million GNP per book, the expenditure of \$105 billion should lead to the production of approximately 4,000 new books by 1975 directly related to the subject matter of environmental sciences. The attendant array of journal volumes, reports of governmental agencies, etc., should boggle the collective minds of library scientists. We have already suggested that academic institutions will produce a substantial majority of this flood of information and will be absolutely dependent upon university libraries for resource support in

this burgeoning area. The challenge to university librarians is weighty, direct, and immediately at hand.

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## Environmental Information From Other Organizations

Stephen Quigley's paper following this one deals with the professional and technical societies and their publications as sources of information on the environmental sciences; while my subject is the *other* organizations. This designation brings to mind the other woman. Is the relationship of these other organizations to our general subject somewhat suspect, while the professional societies are legitimately wedded to it? How did we *other* organizations get into this respectable company, alongside government, academic, and professional sources? Is not our scientific purity questionable? Has not our reputation been compromised since we have been seen in nonscientific company—bird watchers, peaceniks, health nuts, propagandists for and against various laws and regulations, people over 50 who could not pass today's high school chemistry courses and people under 20 who find these courses irrelevant?

The fact that the planning committee chose to have the *other* organizations discussed at this Institute tells us that the environmental sciences differ in some way from the other physical sciences. Would an institute whose purpose was to explore sources in any other science think that other organizations concerned with the subject had something important to say? It seems unlikely. But the environmental sciences *are* different because they stand at the interface of science and society. They are immediately relevant to everyone who lives and breathes and wants to continue doing so, to everyone who wants to pass on an environment to the next generation in which living and breathing continue to be possible. That is the reason many more people need to receive information about the environmental sciences than about other sciences, and why there are organizations whose principal purpose lies elsewhere, but who nevertheless find it necessary to disseminate some scientific information along with legislative information, advocacy of political action and other material. It is also the reason there are organizations which

are not governmental, academic or professional, but *other*, which are devoted specifically to the dissemination of scientific information on the environment. In this category are the Scientists' Institute for Public Information and the local groups associated with it, such as the St. Louis Committee for Environmental Information.

Social, economic, and political decisions are constantly being made which have important effects on our environment. These decisions range all the way from action to control the waste a particular industry is dumping into a particular stream, to national programs for future sources and uses of electric power. If these decisions are to be sound, they must be based on an understanding of the relevant scientific and technical information. This information must be in the hands of the people who make the decisions. If decision-making is not to be limited to a small group of government officials, advised by a handful of scientists and influenced by another handful of powerful industrialists and financiers, the information must be in the hands of many men and women and all the elements of the decision-making exposed to public scrutiny.

In every science there is, of course, a large gap between what the experts know and what others know—including other scientists, in this age of specialization. No one expects to make experts of us all; we are not trying to fill in the gap by dumping into it the mountain of material created by the information explosion. We are trying to bridge it by communicating that part of the information that people need to know in order to participate in social decisions about the environment.

I particularly welcome the opportunity to discuss this question with librarians who are professionally concerned with bridging all kinds of information gaps and are quite accustomed to functioning in the uncomfortable position in which we now find ourselves—trying to keep our feet firmly on the ground where the public is, while reaching across the chasm to get hold of the information they need. Librarians are well aware that finding specific pieces of information to answer specific questions, difficult as that may be, is the easiest part of the problem. Librarians are familiar with the more difficult task of selecting from the mass of material available information in the amount and at the technical level that can be understood by and that will meet the needs of a particular individual or group, at the same time winnowing information from opinion and from downright *misinformation*. And in trying to meet the needs of people for environmental information, this is not the first time that librarians will have had to cope with the contradictory situation that the more people need to know about a subject, the less they are aware of exactly what kind of information they are after, and therefore the more help they need. It is easy to help a student in a school library or an adult in a public library who knows that he wants information about the federal air

pollution standards. But how does one help the one who had not yet focused on a particular question and just asks for information about "air pollution"? Then, as people become better informed, the questions begin to get more difficult again. A medical student or a student in some other field with a little science background who wants to know the health effects of air pollution is not hard to satisfy—periodically, reviews of the current state of knowledge appear in one of the medical journals<sup>1</sup> or in government publications like the criteria documents that preceded the setting of federal standards for the various pollutants.<sup>2</sup> But suppose this same student, after digesting the material on health effects, wants to know why we are moving so slowly in the direction of meeting the standards that are supposed to protect our health, and how the process can be speeded up. These are much more difficult questions to answer, and material from some of the *other* organizations can be useful in coping with such questions.

My view of libraries and librarians is perhaps colored by the fact that I got at least as much of my early education from the shelves of the public library as in classrooms. But I don't think I am making a subjective judgment when I say that librarians have made an inestimable contribution to an informed and educated public in the great tradition of Jefferson who maintained that the "diffusion of knowledge among the people" would qualify them to "understand their rights, to maintain them and to exercise with intelligence their parts in any government."<sup>3</sup>

The knowledge required for all of us to "exercise with intelligence our parts in government" has become greater in amount and more technical in kind in recent years, and this has contributed to the erosion of democracy and the alienation of the people from their government that has gone so dangerously far. These changes have also made the task of the librarian increasingly difficult, yet more crucial than ever.

The *other* organizations, although they differ widely among themselves, can be useful sources in this situation because they begin with an environmental problem that requires social action for its solution and present information relevant to that problem. That is, they help people who do not know what questions to ask, by asking questions that are or should be in the social arena; and they help people who know what information they want by providing the information they need without burdening them with what is unnecessary or irrelevant.

Since we are talking about scientific information, the scientists are the ultimate source. Only a few *other* organizations are able to employ scientists, except perhaps occasionally in a consultative capacity. They must go to scientists in academia or in government, or to the publications of professional societies for their information. They do not publish original scientific material—results of new experiments or investigations. What they do is select

and organize it in a different way, and express it in language more understandable to the nonscientist. But why should this not be done by academic and professional publications? And why is it not being done by the government? Why are *other* organizations necessary?

### Academic and Professional Sources

One reason academic departments and professional societies have not met the need is their fragmentation into disciplines, and within disciplines into specialties, while understanding of environmental problems almost invariably requires information and insights from many disciplines in the natural sciences, the health sciences, engineering and other technologies and the social sciences, not to mention architecture, planning and law. The problem became evident when universities began to seek ways of incorporating the environmental sciences into curricula in new ways. Approaches ranged from proposals for a new discipline called ecography<sup>4</sup> to a suggestion that what is required is an adisciplinary approach.<sup>5</sup> In between there is a variety of environmental institutes, interdisciplinary courses, and courses within conventional departments which have nevertheless burst the disciplinary restraints in some way.

Professional publications have also tended to represent rather narrow specialties, but there have been some important changes in the last few years. When *Environment* (then called *Scientist and Citizen*) began its efforts to bridge the information gap, there was no *Environmental Science and Technology*, no *Technology Review*, no *Environmental Research*, no *Advances in Environmental Science and Technology*. Technical journals like the *Journal of the Air Pollution Control Association* were much narrower in their scope. Outside of *Archives of Environmental Health*, consideration of environmental health problems in the medical literature was extremely limited. In recent years, *Science* has tremendously increased the pages devoted to articles of broad interest on the environment, as well as including more specialized reports from this field, and now gives a great deal of space to environmental news in its "News and Comment." Numerous symposia and one entire annual meeting of the American Association for the Advancement of Science have been devoted to environmental problems and have included historians<sup>6</sup> as well as ecologists, and professors of literature<sup>7</sup> as well as professors of the earth sciences. At the December 1972 meeting there was a symposium on scientists in the legal system and another on the Alaska pipeline, a case in which scientists, lawyers and conservation groups all played a role.<sup>8</sup> An interesting development in this regard is the Committee on Environmental Alterations within the AAAS, which has just completed a major study of environmental problems and social issues associated with the generation of electric power. The study was done in cooperation with the Power Task Force of the Scientists' Institute for Public Information and was therefore a combined effort of a professional society and one of the *other* organizations.

Other symposia and study groups have brought scientists together from many disciplines to consider environmental problems. I want to discuss not what these sources *do* provide, but what they *do not*. While the situation has vastly improved, most—though not all—of the strictly scientific sources still require translation into layman's terms to bring them within reach of the undergraduate in the humanities or social sciences, the college-educated adult who was not a science major, or readers with less educational background. And although many of the articles in these journals and books are relevant to social issues, they are often focused on a very small piece of the evidence, and seldom give the reader help in fitting that small piece into the larger whole. In other words, they tend to give more information than the concerned citizen needs to know about only a very small part of the picture that interests him. In the case of water pollution, for example, both the continued fragmentation and the paucity of material that will help people figure out what the problem is all about both scientifically and socially are illustrated by the difficulty *Environment* has had in getting suitable articles on this subject from scientists. Although we have published some good material, we have been quite dissatisfied with our coverage of the issue. Two of our staff members have now sifted through an immense amount of scientific material from the professional journals and government sources, sought out the important strands running through the material, consulted with various biologists, chemists, limnologists, and finally put the material together in a form that will have meaning to someone who wants to know about water pollution. This will be a book,<sup>9</sup> and much of it will also appear in the magazine. Another indication that the academic and professional publications are not meeting the need for material drawn from many sources and focused on particular problems came from a readership survey made several years ago, in which we asked the scientists among our readers to compare *Environment* with the other sources of environmental information they use. Approximately 60 percent of those responding said they found information in *Environment* not readily available elsewhere, and among those who gave *Environment* as their preferred source, the most frequently listed reason was that the magazine draws together information from many sources.

### Government Sources

Government agencies, unlike academic departments and professional societies, are organized to deal with particular problems, and therefore governmental material does often focus on problems or issues, although it falls short in a different way. In spite of a vast increase in the quantity of government material on the environment, some of it of very high quality, it remains true that the delivery of the relevant information to the citizen all too frequently breaks down at very crucial points because the agency involved is committed

to a particular course of action and perceives its public education role as that of persuading the public that this is the correct course. Sometimes scientific information produced by scientists working for or advising the government and highly relevant to social decisions is not released or is deliberately suppressed. More than one *other* organization has performed an extremely important public service by issuing relevant information withheld by the government, forcing relevant information out of the government bureaucracy, or taking issue with inadequate or misleading information from government sources. I will cite two recent examples.

The Union of Concerned Scientists is a Boston area coalition of scientists, engineers, and other professionals. In July and October 1971 they issued two papers on the safety of emergency cooling systems in nuclear reactors.<sup>10</sup> Largely as a result of this, in January 1972 AEC hearings on the subject began with sixty environmental groups joining the Union of Concerned Scientists as the Consolidated National Intervenors to participate in the hearings. Other participants are reactor manufacturers, electric utilities, and the AEC regulatory staff. Although there have been obstacles to a full and complete record, and it took the threat of lawsuit under the Freedom of Information Act to obtain release of some internal AEC documents, considerable information has been brought to light indicating grave doubts about some of the AEC's safety criteria.<sup>11</sup>

About six years ago, the herbicide 2,4,5-T began to be suspected of causing fetal deformities. Its use was continued without restriction until April 1970 when the controversy over its hazard finally brought a ban by the Environmental Protection Agency on its use on crops, near water, and around homes. Two manufacturers of the herbicide petitioned for a scientific advisory committee to review the decision as it related to crops. An advisory committee was selected from a list of names provided by the National Academy of Sciences. The committee advised EPA to lift all restrictions on the use of the herbicide, even those not contested by the manufacturers. The advice was accepted and the ban lifted. The report was not made public. However, one member of the committee dissented and leaked the report to colleagues in the scientific community. As a result, a detailed critique of the report was prepared by the St. Louis Committee for Environmental Information, reviewed and endorsed by other scientists and released to the press by CEI spokesmen, together with Harrison Wellford of Ralph Nader's Center for the Study of Responsive Law and Samuel S. Epstein, chief of the Laboratories of Environmental Toxicology and Carcinogenesis of the Children's Cancer Research Foundation and executive secretary of the Environmental Mutagens Society.

In this case, EPA proved to be more responsive than the AEC. The ban on 2,4,5-T was restored by EPA administrator William Ruckelshaus, who also

announced that in the future, advisory committee reports would be made public.<sup>12</sup>

### Old Organizations—New Interests and New Organizations

Most of the *other* organizations do not deal solely with scientific information, and many of them have interests other than the environment. Among them are a number of groups that were in existence long before the current interest in the environment burgeoned. These groups contributed to developing the current interest and have responded to it by expanding or reorienting their focus to include environmental concerns and to disseminate some environmental information.

The *National Tuberculosis Association* has become the National Tuberculosis and Respiratory Disease Association (1740 Broadway, New York 10019), and has established a National Air Conservation Commission which has drawn on the public education experience of the parent organization to disseminate information about air pollution. It publishes a regular monthly newsletter and other leaflets and pamphlets on air pollution, some of them designed to put the necessary information in very simple terms.

*Consumers Union* (256 Washington Street, Mount Vernon, New York 10550), although it deals with produce information in its monthly *Consumer Reports*, now considers not only the safety, performance, and durability of a product, but also its impact on the environment. From time to time this leads them somewhat beyond the question of choices among various brands of a similar product, to point out that the environmental impact of an entire class of products—e.g., phosphate based detergents—cannot be solved by individual selection, or to consider some other broad environmental problem.

*Resources for the Future, Inc.* (1755 Massachusetts Ave., N.W., Washington, D.C. 20036), funded by the Ford Foundation, puts out a bulletin entitled *Resources* three times a year, but its more important output is books, many of them the outgrowth of conferences and symposia sponsored by RFF. Its purpose is "to advance the development, conservation, and use of natural resources and the improvement of the quality of the environment." Unlike many of the other groups discussed here, RFF's principal focus is on the economic aspects of the subject.

However, the largest number of groups in this category are the conservation organizations. Most of these groups have always been concerned with an appreciation and an understanding of nature, and the preservation of wilderness areas and endangered species, and these purposes require information from the environmental sciences. But the conservation groups now concern themselves with the environmental effects of such technological projects as the Alaska Pipeline, the underground nuclear tests in Amchitka, big hydroelectric dams and the siting and safety of nuclear and fossil-fueled power

plants, and with such broad—and originally urban-oriented—issues as air and water pollution. I can mention here only the major national organizations which publish information helpful to the amateur naturalist and/or the environmental activist. There are other national organizations and many regional or local ones, citizens organizations for clean air or water, and women's groups like the League of Women Voters and the American Association of University Women which have very active programs around local or regional environmental issues.

The *Audubon Society* (1130 5th Ave., N.Y. 10028) publishes a magazine six times a year, with a major emphasis on nature appreciation, but now including a section of "Econotes" on environmental legislation and other news, and some major articles dealing with the environmental impact of various aspects of our technological society. Some of the well-established chapters of Audubon put out publications that are more than local newsletters, sometimes digging into local environmental issues in some depth. The Audubon Society publishes books as well, usually in their traditional area of field guides for the amateur naturalist, or descriptive appreciation of nature.

The *Sierra Club* (1050 Mills Tower, San Francisco 94104) known in the past for its mountain climbing trips and its beautiful books of nature photography, has expanded numerically, geographically, and in terms of interests. Its bulletin appears ten times a year. Some of its recent books are quite a contrast to its picture books. For example, Peter and Katherine Montague recently wrote a carefully researched Sierra Club paperback on mercury as an environmental hazard which presented scientific information in language the nonscientist could understand.

The *National Wildlife Federation* (1412 16th St., N.W., Washington, D.C. 20036) publishes *National Wildlife* bimonthly. Although pictures and articles about wildlife still fill most of its pages, the goals of the federation are broader than this would imply. It is concerned with getting the facts to the public on a broad range of environmental issues and in participating in legislative and court actions in the battle to save the environment. Other publications are *Conservation News*, *Conservation Report* and *International Wildlife*.

*National Parks and Conservation Association* (1701 Eighteenth St., N.W., Washington, D.C. 20009) publishes *National Parks* monthly and is issuing a series of comprehensive forestry studies.

The *International Union for Conservation of Nature and Natural Resources* (1110 Morges, Switzerland) has been in existence for twenty-four years and includes both official government representatives and conservation organizations. Its *IUCN Bulletin* is concerned with endangered species and national parks, and, perhaps because of the presence of official representation, the union has been slow to respond to the recent changes in environmental concerns.

The *Conservation Foundation* (1717 Massachusetts Ave., N.W., Washington, D.C. 20036), unlike the groups mentioned above, is not a membership organization. It publishes the monthly *CF Newsletter* which focuses on state and federal legislation, and frequently more substantial publications. *Your Right to Clean Air* is a manual for citizen action combining information about where and how citizens can act with some basic facts about what the pollutants are and at what concentrations they affect people, plants and materials. One of its items under "Planning an Action Program" is: "Ask your public library to create a special collection of materials on air quality and other environmental issues and to advertise their availability."<sup>13</sup> This free pamphlet was produced under a grant from the federal government. Prices of other material prepared by the foundation staff on contract by others, or through support from Ford or another foundation, range from inexpensive or free pamphlets to such books as Ian McHarg's *Design with Nature* at \$19.95. The foundation library is open for reading and research, but materials may not be borrowed. However, consideration is given to requests from other libraries, and environmental libraries may be able to work out exchange arrangements.

There are also a number of new organizations which have grown up within the last few years:

*Rachel Carson Trust for the Living Environment, Inc.* (8940 Jones Mill Road, Washington, D.C. 20015). After the publication of *Silent Spring*, Carson was deluged with questions and requests for information about pesticides and other environmental matters, and hoped to set up some kind of information service to respond to this need. After her death, the Rachel Carson Trust was established to further her work and to address this need for individual guidance. It has a pesticide guide in progress and is issuing a series of small pamphlets.

*Friends of the Earth* (30 East 42nd St. New York, N.Y. 10017 and 451 Pacific Ave., San Francisco, California 94133), from its beginning in a split in the Sierra Club, has grown into a sizable national organization which has taken an active and sometimes leading part in legislative and court action on environmental issues. They put out a monthly publication entitled *Not Man Apart* and have done some books through commercial publishers. The first of these, the *Environmental Handbook*, was hastily compiled for the first Earth Day and is not as useful as one would hope from the title.

*Environmental Action, Inc.* (1346 Connecticut Ave., N.W., Washington D.C. 20036) was begun at the time of the first Earth Day, and is one of the more enduring outcomes of an event which spawned a great many brief actions and short-lived organizations. Environmental Action is a political lobby, organized to focus concern on the environmental crisis. It puts out a lively newsletter twice a month.

*International Institute for Environmental Affairs* (United Nations Plaza at 46th St., New York 10017) is less lively and more establishment-oriented than some of the above. It served as technical advisor to the State Department at the U.N. Conference on the Human Environment at Stockholm in 1972, and produces the *World Environment Newsletter* for Norman Cousins's new *World* magazine—environmental news from around the world and brief reviews of books and periodicals in the field.

Even this brief list includes a wide variety of publications with differing goals, varying degrees of expertise, and different degrees of usefulness as information sources. There are a great many action groups and some, in particular those with single goals, are not always reliable as information sources. For one thing, they tend to oversimplify. As an illustration: in a crusade for a bond issue to get a sewage treatment plant for a city, all the information issued by the campaigners might be accurate as far as it goes, and the plant might be quite necessary under the circumstances. But as information on water pollution, it might be quite misleading if it focused entirely on the treatment of human waste, ignoring problems of industrial waste (which are quite different), of phosphate waste from detergents, and of thermal waste from power plants.

There is another trap for any group that does not have active scientific participation and careful scientific review of its material. It is a great temptation to disseminate any piece of information or any scientist's opinion (which are different things) if it seems to lend support to the organization's goal. It is difficult for the layman to distinguish between the significant and the trivial, a good and a poor study, a well-documented conclusion and an unsubstantiated personal opinion.

A third difficulty is that of keeping up with advances in environmental science and with changing perceptions of the kind of social action necessary to deal with environmental problems. In science, yesterday's accepted hypothesis becomes today's conventional wisdom, while it is being challenged today and perhaps superseded tomorrow. In social action, both government agencies and environmental organizations sometimes come to a conclusion too quickly on what they believe to be the cause of an environmental problem, and therefore on what should be the solution.

It is easiest and most obvious to look for the solution to a problem at the end of a process, for example, emission control devices for automobiles. That leaves the design and engineering much the same, disturbs the automobile manufacturers the least and leaves the highways, the urban sprawl, and the generally accepted lifestyle pretty much as they are. Now questions are being raised about whether the internal combustion engine should be re-engineered or replaced with a different type of engine, whether we need to find ways to adapt mass transportation to our present megalopolises, or whether we need a whole new approach to city planning and land use.

Sometimes the scientific and technical information that appears in the publications of *other* organizations—or of government and professional organizations, for that matter—may be perfectly correct as far as it goes, but may not go far enough.

Citizens groups are often seen primarily in a negative role, expressing opposition to some kind of developmental action that they perceive as environmentally undesirable. All parties in such controversies need good information, but more than this, the framework needs to be enlarged so that citizens who are concerned about the environment can have an input at an earlier stage in the decision-making process. They would then not be limited to rejection of projects with undesirable environmental impact, but could have a positive influence on the planning of environmentally desirable interactions between the society and its physical environment.

A big part of bridging the information gap a few years ago was simply the task of creating a public awareness that something needed to be done. A climate of opinion was created in which problems could be addressed and environmental impacts could be taken into consideration. Now we must broaden that awareness and spread the understanding that environmental issues go far beyond the conservation of a species or a place—important as it may be to preserve bald eagles or recreation areas—that they involve more than air pollution control programs and sewage treatment plants. How we interact with the world in everything we do—from raising food and digging minerals to generating electricity and building cities—is an environmental question.

We need a climate of opinion which will recognize this and will permit an open look at different ways of relating to the environment. Many individuals, families and groups of families have changed their lifestyles partly in order to establish new relationships with their natural environment. But we are talking about major social issues which cannot be solved by changes on the part of individuals and small groups, but only by changes on the part of whole societies. It presents all concerned with environmental information with a new and very big educational job.

We are very fond of the adversary approach in this country as a way of getting at the truth; in the environmental field the adversaries before Congress or in court have often been the conservation groups on one side and the corporations on the other. One certainly could consider industries as among the *other* sources of environmental information and perhaps there might be a temptation to do so in order to balance material from the action groups. Industries spend considerable money issuing press releases, preparing testimony, buying advertising, and putting out what are called “informational” pamphlets. However, industry material is more likely to confuse than to illuminate the issue. It is not simply biased in a different direction from that

of the conservationists; industry bias stems from economic self-interest and experience has shown that it is frequently unsupported opinion and almost never a full or fair presentation of the facts.

One of the problems that has been raised at this Institute is: as a librarian becomes involved in dispensing information in a controversial context, he or she will become an advocate, while traditionally librarians eschew advocacy. Certainly, the task is to provide all sides with the best information at one's disposal, but the fact is that an industry or a government agency usually has a staff and a budget which permits the gathering of information and the presentation of a case, although this is not always true of small, local government agencies. The people who are desperately in need of help in finding the information relevant to the controversy are the citizen activists, and therefore librarians may be accused of advocacy simply because they are responding to this need. The only way to deal with this situation as a librarian is to do the positive and important thing: perform a conscientious informational job instead of being forced into the position of defending neutrality by presenting the *opinions* on both sides. Those who are already convinced, and even more, those who have yet to make up their minds, need information and need help in untangling information from opinion.

It is important to keep in mind that many of the environmental controversies which appear to be disagreements about the *information* are really differences in value judgments about how to behave in the absence of hard information. We seldom have such good information about the long-term health effects of low levels of environmental contaminants that we can say unequivocally that a certain level will cause a certain number or percentage of a given effect in the exposed population. Industry has frequently responded to this situation by saying we do not have enough information to institute controls—on sulfur dioxide in the air, for example. A citizens committee for clean air may counter that we have ample evidence of the ill effects of air pollution in general to move against it without having hard data on specific effects of certain levels of each pollutant. Unfortunately, one side (or both) sometimes claims more for the evidence that it will bear: industry places a high value on avoiding the economic expense of control; citizens place a high value on human health; this difference in values sometimes leads to misuse of the information. Industry has sometimes claimed that sulfur dioxide is harmless while citizens claim that respiratory illness and death due to air pollution in general is due to sulfur dioxide in particular. In such controversies, an information specialist who is not an advocate can make an important contribution. Injecting his or her own values into the controversy would not help; providing the contenders and the public with good, solid information can help a great deal.

## Public Interest Law

One direction in which many conservation groups have moved in recent years is to take action singly or in combination, to oppose actions and projects they consider to be environmentally unsound through regulatory agencies and the courts. At the same time, an organization has come into existence in which scientists and lawyers have joined together specifically for the purpose of fighting environmental cases—the *Environmental Defense Fund* (162 Old Town Road, East Setauket, New York 11733). Both their legal suits and other actions—such as a petition to HEW for action on lead pollution—are backed by scientific information, and both the EDF cases and cases involving other conservation groups have played an educational role as the cases are reported in the media and in the publications of the various organizations. The EDF newsletter, appearing six times a year, is too brief to include the data that are the cores of their cases, and the cases are not a *direct* source of scientific information for libraries.

Also concerned with the new field of environmental law is the *Natural Resources Defense Council, Inc.* (36 West 44th St., New York 10034 and 1600 Twentieth St., N.W. Washington, D.C. 20009). It puts out a quarterly newsletter dealing with environmental law and related topics and has also prepared action packets for citizens on the Soil Conservation Service's stream channelization policies.

In the Alaska pipeline case, the Friends of the Earth, Environmental Defense Fund, and Wilderness Society worked through the *Center for Law and Social Policy* (2008 Hillyer Place, N.W., Washington, D.C.) which provides legal representation in such areas as environment, health services for the poor, and consumer protection.

Ralph Nader's *Center for the Study of Responsive Law* (Box 19367, Washington, D.C. 20036) is of course not concerned solely with environmental questions, but has done reports on air and water pollution and on food contamination. Since the reports of Nader's Raiders become well-publicized books, I will not discuss them here, but it is interesting to note that some of them contain a great deal of useful environmental information focused on a different part of the social process than that dealt with by most other groups. The center is concerned with illuminating the legislative and administrative process, and the way in which special interests influence and distort it. One periodical now coming from the center six times a year is called *The Consumer Protection Report*.

The Center for the Study of Responsive Law has inspired and helped to organize groups on many campuses throughout the country to function locally in the public interest in the manner of Nader's Raiders on the national scene. These groups can be sources of local information.

Another student group which came into being through a workshop

within the academic program, instead of an extracurricular activity, is the *Student Workshops on Social and Political Issues* at Stanford (590A Old Union, Stanford University, Stanford, Calif. 94305). Some, but not all, of the issues they have studied have been environmental and have combined scientific and technical administration with the kind of examination of administrative procedures typical of Nader's Raiders.

Still another focus is that of the *Council on Economic Priorities* (456 Greenwich St., New York 10013) which examines the practices of U.S. corporations in four areas: employment, environmental quality, military production, and political influence. For example, they reviewed corporate advertising and the environment. They have also published in-depth reports on particular industries in which they consider the environmental impact of the industry and what it is doing to control its pollution. Their *Economic Priorities Report* appears four times a year, and the special reports at irregular intervals. This is a relatively young organization which has scored high for the accuracy and pertinence of its information.

Both the public interest law groups and the Council on Economic Priorities make important contributions to environmental information and, although it is not primarily scientific information, scientific and technical data are inevitably involved and usually well handled.

Although they do not fall in the category of "organizations," a word about two other general circulation magazines with scientific content might be in order. Both *Scientific American* and *Science and Public Affairs* (Bulletin of the Atomic Scientists) publish articles relating to the environment along with material on many other subjects. For example, *Scientific American's* special issue on the biosphere in September 1970 included a great deal of useful information. However, this magazine, like the professional journals, is a journal of information which generally does not focus on the issues. *Science and Public Affairs*, on the other hand, does focus on the issues, but although its articles are sometimes quite informative, it is basically a journal of opinion.

### Science Information

The organizations which most directly serve the purpose of providing the public with the scientific information needed for social and political decisions are those that come into being specifically for that purpose. Their roots go back to the 1950s, when there was a definite need for such information that was not being met by professional government organizations, nor by the mass media or the commercial publishers. People needed to know about radioactive fallout—what it was, how much of it was coming down from the atmospheric nuclear tests being carried out at that time, and what its effect would be on people and on the environment. Individual scientists found themselves responding to the need by talking to various groups of citizens, and by 1958

they were responding in an organized way in the New York Scientists Committee for Radiation Information and the St. Louis Committee for Nuclear Information, followed by similar committees elsewhere.

Within a few years, the signing of the Test Ban Treaty made the fallout question less urgent, but at the same time it had become clear that radioactive contamination from nuclear fallout was only one example of human intervention in the environment where a basic scientific discovery had been followed by technological application and immediate use in spite of ignorance of biological effects. The science information committees decided to coordinate their efforts through a national organization and to widen the scope of their interests. The national organization is the *Scientists' Institute for Public Information* (30 East 68th St., New York 10021) and most of the associated committees are now concerned primarily with environmental information. *Environment*, which began as the bulletin of the St. Louis Committee for Nuclear (now Environmental) Information is now a publication of the SIPI and draws its material from a wide segment of the scientific community. It has a national and international circulation. The local groups, which are quite autonomous, sometimes issue local newsletters and prepare reports presenting scientific information on local—and sometimes national—problems. The SIPI also has national task forces on some of the major environmental problems. In addition to the task force on energy use mentioned above, a task force on the re-evaluation of pesticide use has a report close to publication. The water pollution book mentioned above will be one of a series on "Environmental Issues" by *Environment* staff members; Barry Commoner is the series editor. Two years ago, the SIPI put out eight workbooks on a series of environmental problems. They were widely used and are still available.<sup>14</sup>

Some of these science information groups include nonscientists and some do not. All are committed to presenting scientific information relevant to social issues, free from bias. We do not advocate particular solutions to environmental problems. While we are in the political arena because we address political issues, we provide only one element of the several which determine action toward a specific goal, others being moral and political values and economic interests.

Because of the intimate involvement of scientists, the rigorous review procedure, the presentation of data, the documentation, the effort to screen out opinion, and the social focus without advocacy, *Environment* and the other publications of the SIPI and its associated groups are useful sources of scientific information for the general public, for the student, and even for the scientist. We have been embroiled in controversies over the accuracy and proper interpretation of our material, or over information circulated by others which we have criticized. Controversies in the magazine have pitted our scientists and staff against the AEC, against a committee set up by the

National Academy of Sciences to advise the government on civil defense, and against various industries—one of which threatened to sue us. These controversies enliven our pages, and we have emerged with our heads unbowed and our reputation in satisfactory condition. Since I can scarcely be considered an impartial critic of *Environment*, I will substitute the evaluation of another observer. After fourteen years of publication, *Environment* is now “widely regarded” in the words of Daniel S. Greenberg’s *Science and Government Report* as “the most independent, scientifically accurate and socially responsible environmental journal for the general public.”<sup>15</sup>

Two other organizations of scientists which, like the SIPI groups, aspire to function as science advisors to the public, are the *Union of Concerned Scientists* (P.O. Box 289, MIT Branch Station, Cambridge, Mass. 02139) whose work relative to reactors has already been mentioned and the *Center for Science in the Public Interest* (1779 Church St., N.W., Washington, D.C. 20036). Neither has a periodical, but both issue press releases and long reports, and their material appears in *Environment* and other publications.

One foreign publication, published in English, although it might be considered government or professional rather than *other*, should not be missed. It is a new bimonthly magazine entitled *Ambio* (Universitets-Forlaget, P.O. Box 142, Boston, Mass. 02113). Although it is rather technical, it does have a good focus on environmental problems and is an important addition to previous sources of information. It is called a journal of the human environment, research and management, and is sponsored by the National Swedish Environmental Protection Board and five other Swedish scientific groups.

The mention of a foreign publication is an indication of an important fact about environmental issues: they are not limited to one country. This is one aspect of what Barry Commoner calls the first law of ecology, “Everything is connected to everything else.”<sup>16</sup> The recent U.N. Conference on the Human Environment in Stockholm was a reminder that not only are we all inhabiting essentially one environment, but also the problems of this environment are deeply imbedded in and the solutions seriously impeded by war, by the uneven development of industrialization and by the present power relationships and economic and political rivalries among nations.

The last of the *other* organizations we will consider here is an international organization of industrialists, educators, scientists and civil servants headed by Aurelio Peccei, former managing director of Fiat. This group has sponsored a project to develop a computerized model of global environmental and social systems in order to determine the implications of world population growth, industrialization, pollution, food production and resource depletion. The project was financed by the Volkswagen Foundation and carried out at M.I.T. A nontechnical report, *The Limits to Growth*, by Donella Meadows

and others have attracted a great deal of attention.<sup>17</sup> The computer can deal with many numbers relating to a variety of factors which interact with each other in complex ways, but of course the computer has to be told what those relationships are. The Club of Rome study has attracted some severe criticism on the basis of the assumptions about these relationships programmed into the computer by Meadows and her colleagues, and it is these assumptions which essentially determined what came out the other end.<sup>18</sup> For example, how is pollution related to food production? How is population growth related to industrialization? Neither of these is easy to determine, especially on a worldwide scale, while the relationship of pollution to population growth is the subject of vigorous debate.<sup>19</sup> It is beyond the scope of this paper to discuss either the predictions made by Meadows or the criticism. I mention the project for two reasons. First, we are likely to hear more from the Club of Rome; the substantial financial and technical resources it commands assure that the studies it sponsors will receive wide publicity and serious attention from the decision-makers in many governments and from the general public as well. It is important that we not be overawed by this prestigious assemblage of talent and money and accept its products unquestioningly as authoritative scientific information.

Secondly, this report illustrates a problem all of us concerned with environmental information now face. A few years ago, our principal task was to alert the public to the existence of variety of environmental problems and to explore their dimensions. Not everyone is yet convinced of the seriousness of the environmental crisis; the need to alert people to the dangers to the environment is by no means over. Much research in the laboratory and the field is still needed and its results must be passed on to the public as well as to the scientific community. However, this is no longer enough. We now need a more penetrating examination of the causes of the problem in order to guide us toward the proper solutions. We also need a careful examination of the costs and effectiveness of various solutions. The Club of Rome project recognizes that the rates of growth of pollution, population, industrialization, etc., are the products of a complicated social and economic system, but *how* this happens, the way this basic cause of major environmental problems operates, and therefore how things might be changed, is not illuminated.

It is indeed difficult to predict what will happen if we continue on our present course, while to predict the results of changes in the way we deal with our environment is still more difficult. While it is possible to assemble data on various threats to the environment, this is seldom the case with evaluations of possible ways to avert these threats.

Of course, one can say, after a period of testing, that a given air pollution control device will reduce by a predictable amount a certain type of emission from an industrial stack or an automobile exhaust. But if we add up

the achievements of all the devices we plan to put on all the automobiles and stacks, we find that this will still leave us with a serious air pollution problem.<sup>20</sup> We find that we need to explore more basic changes in production processes and in land use. Both of these would in turn require changes in the way we do things economically and politically, not just technically. This means more difficult problems for those of us in *other* organizations who are trying to provide the relevant scientific information, and more difficult problems for librarians in getting relevant information to the various specialized groups librarians serve in universities and industry, as well as to the general public.

For this reason (among others) there are likely to be additional *other* organizations involved in the dissemination of information and in action. Some of these may be organizations which see environmental degradation as a threat to their own values and economic interests, while others will see the movement to reverse environmental degradation as a threat to their values and interests.

If librarians are alert to the changing environmental picture, they will find new information sources emerging as new groups become engaged with the problem and as the information needs of the people they serve change. Libraries can be much more flexible in responding to these changing needs and sources than government bureaucracies and educational systems which tend to be unwieldy and slow to change. I would like to put up just a few tentative signposts to suggest some emerging areas of interest where information will be needed, and will hopefully be forthcoming.

There is a parallel in medicine to the development of public interest law. Although its major emphasis has been on delivery of health care to the poor, this interest leads to a concern with the unhealthy environment in which many of our people live, to a new emphasis on preventive medicine, to attacks on such environmental problems as lead poisoning in the slums and to a recognition of other environmental problems. At the same time, urban housing and transportation, which have been quite separate issues, are more and more being seen as environmental issues. Moreover, the issues of resource depletion and environmental pollution—especially as they relate to our use of energy—have already merged. Both affect the way we plan (or do not plan) cities and suburbs, the way we build and demolish city structures. That is to say, various issues of the urban environment are becoming increasingly important and increasingly interrelated.

The internal environment of the industrial workplace is a neglected concern which is also related to the external pollution caused by the wastes from the same industries. Organized workers are beginning to take an increasing interest in both aspects of this question, as well as in the possibility that their jobs or their wages may be affected by some pollution control measures.

Foreign policy is another arena which will be replete with environmental issues in the future. The underdeveloped countries have a very different perception of environmental issues than do highly industrialized countries. There will be questions of whether we are exporting environmental problems as part of trade and aid or whether we can help other countries avoid our past mistakes as they develop. Let us hope that the crimes we have committed against the Indochinese environment, as well as its people, are now coming to an end and that we will never repeat that sorry chapter in our history in any other part of the world.

As indicated above, the probing for causes and the search for solutions will be of overriding importance. These issues will undoubtedly engender some new ideas and possibly some new kinds of information sources. They will probably continue to fuel some fierce controversies. Information specialists (not advocates) will be desperately needed here to help keep the controversies from being oversimplified. Observing the harmful impact of technology on the environment, there are some latter-day Luddites who are ready to condemn technology, but everyone who questions a particular technology is not advocating a return to horse-and-buggy days.

The perception of our world as a finite planet with limited space and resources is beginning to seep through to the consciousness of many who once thoughtlessly accepted the idea of indefinite growth. This is an important change in our way of looking at the world, but it does not mean that we must oppose all growth. Our task is infinitely more difficult than such simplistic solutions would imply. Rather than spending ourselves in fireworks and never getting down to fundamentals, we must focus beams of light from every possible direction upon the points of controversy so that the complexity of the problems becomes clear and the controversies advance our understanding.

Debates must not be on economics versus biology or technology versus conservation. Librarians need to help the engineers, the politicians, the economists, the students and all concerned people to think biologically, to understand that there are biological imperatives which must be understood and accepted if man is to survive. But neither environmental scientists nor environmental organizations alone can supply the answers to how to adapt our society, our economic structure, our technology to these biological imperatives. In this effort we need the economists and the engineers; we need the students who will take a fresh look at old assumptions and old ways of doing things. We may need a whole new politics. Certainly, at every step of the way we need the best information we can get—biological, economic, technical, political. The excitement of the first Earth Day has subsided, but the big environmental education job is still ahead.

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## Scientific and Educational Society Activity in the Environmental Sciences

The nature of the work done on environmental problems at the American Chemical Society depends, of course, on the nature and purpose of the society. The society is a nonprofit scientific and educational society with a membership of 110,000 chemists and chemical engineers. Founded in 1876, the ACS has become the world's largest membership organization devoted to a single science. It operates under a national charter granted in 1937 by the seventy-fifth Congress and signed into law by President Franklin D. Roosevelt on August 25, 1937. Under the provisions of the charter, the objectives of the society are: (1) to encourage in the broadest and most liberal manner the advancement of chemistry in all its branches; (2) the promotion of research in chemical science and industry; (3) the improvement of the qualifications and usefulness of chemists through high standards of professional ethics, education, and attainments; and (4) the increase and diffusion of chemical knowledge, and by its meetings, professional contacts, reports, papers, discussions, and publications, to promote scientific interests and inquiry. It should thereby, foster public welfare and education, aid the development of our country's industries, and add to the material prosperity and happiness of our people.<sup>1</sup>

The charter also imposes an obligation on the ACS to provide technical advice and investigative and research assistance to the federal government on public issues and problems. The ACS's pursuit of these objectives is facilitated by its unique network of 175 local sections serving members in the United States and Puerto Rico, its 26 technical divisions dealing with the principal fields of chemistry and chemical technology, and a board range of scientific and educational activities, public affairs programs, technical meetings, and authoritative journals.

The ACS does not operate any chemical research or production facilities. The distinctive characteristic that it does have is a reservoir of intellectual, scientific and technical resources represented by our diverse membership. This paper begins with a brief description of how ACS focuses these resources on environmental questions, followed by a discussion of the results achieved, including the recommendations developed for specific environmental problems.

The ACS has been active in environmental chemistry for many years, but the work discussed here started in 1965. At that time the environment was beginning to accelerate as a national issue. More and more people were demanding clean air and water without worrying very much about how these laudable goals were to be achieved. I suspect that a lot of people have attacked environmental problems without much forethought, but that trend seems to be ending. The solutions to environmental problems are difficult enough when one knows what he is doing.

Historically, the ACS's activities in matters of the environment have largely been conducted through its technical divisions and committees. These activities involve primarily the organization of scientific and technical meeting programs. More recently, with the support of the Division of Water, Air and Waste Chemistry, the ACS founded the monthly publication *Environmental Science and Technology*, whose first issue appeared in January of 1967. Edited for scientists and engineers engaged in the study and maintenance of our natural environment through the use of chemical principles, *ES and T* was the first journal to serve this important field.

Through scientific papers on fundamental research and technology in water, air, and waste chemistry, authoritative news reporting, interpretive articles by invited experts, and staff-written commentary on the political and industrial aspects of environmental management, *ES and T* offers the widest range of information available. Each monthly issue presents new knowledge and promotes scientific inquiry in such areas as the chemical nature of the environment, environmental changes through pollution or other modifications, beneficial technological control of the environment, and the chemical nature of water, air, and waste as they affect urban, industrial, and agricultural activities.

The membership of the divisions includes many of the people trained in chemistry and closely related sciences who are working on problems of environmental quality in the United States. Other ACS members are knowledgeable in the chemistry of the problems that need to be solved. However, the divisional programs and the new journal provide services largely for the expert—the trained chemist or engineer who is working in some phase of environmental chemistry.

In 1965 the ACS's board of directors established the American Chemical

Society Committee on Chemistry and Public Affairs to provide a more coordinated approach to fulfill its obligations as an organization under its national charter. In so doing, the ACS board recognized the ACS's responsibility to exert more effectively the influence of the discipline of chemistry in the solution of major problems of vital importance to the national health, welfare and defense.

The Committee on Chemistry and Public Affairs saw in environmental improvement an area in which it might perform the kind of specific public service that was its proposed mission. The committee decided that an analysis of the important chemical aspects of pollution, backed by extensive documentation, could be developed into a coherent chemical picture that would refresh the expert working in the field and also inform the involved and educated layman. This project was begun early in 1966 under the aegis of the Committee on Chemistry and Public Affairs, which sponsored a task force of some twenty-five experts drawn from the technical divisions and committees of the ACS. This expertise, as well as that of a number of other authorities who are both members and nonmembers of ACS, has been taken advantage of in efforts to develop dispassionate and specific analyses and solutions of the chemical problems involved in managing the environment.

The aim of this report was to set down in one place an objective account of the current status of the science and technology of environmental improvement: what is known and how it is being used; and what must be learned and how it might be used. We did not attempt to write an all-encompassing textbook or primer. We stressed, instead, those problems that we believed to be at the same time important to environmental quality, and accessible to attack on the basis of current and prospective chemical knowledge. The report did not dwell too long on the dimensions of the pollution problem, except where one or more of those dimensions was specifically germane to the point at hand in the social, political, economic, or organizational questions that it raised. The intent, rather, has been to focus strongly and specifically on chemistry, chemical engineering, and the related disciplines, and thereby to stimulate the chemical awareness and the flow of chemical know-how that are essential to any long-term rational approach to understanding and controlling the environment.

We stressed the fact that a strong vein of chemistry runs throughout environmental science and technology, and we stressed that fact without fear of being accused of displaying excessive self-interest. We tried to stress it without obscuring, or appearing to obscure, the undeniable complementary fact that solving the technical problems of environmental management will require the best efforts of scientists and engineers from many disciplines. The ACS speaks with special concern to the world of chemistry, however, and believes that environmental problems do provide, at the very least, a fit

intellectual match for the talents of those chemical scientists and engineers who wish to work at the worthy mission of making a cleaner world.

Those who have worked on such a project know that in some ways it is not unlike being disemboweled with a dull spoon. We have been fortunate enough to find the results well worth the intermittent agony. The 250-page document, published in September 1969, is entitled *Cleaning Our Environment—The Chemical Basis for Action*,<sup>2</sup> and covers air, water, solid wastes, and pesticides, and includes more than 500 literature citations.

As a public service, the ACS distributed about 21,000 copies of the book, including copies to every member of Congress, state governors, pollution control agencies, conservation organizations, and others. The initial printing was 25,000, and the remaining 4,000 were made available for public sale. The book is now in its sixth printing and more than 50,000 copies have been sold, and sales remain at about 700 per month. Translation into Italian, Arabic, and Japanese has been authorized. The report is being widely used as a text in more than a hundred university and college environmental science courses.

The publication and its seventy-three recommendations also aroused interest in the government. In the fall of 1969 the recommendations were discussed in a general way with the President's Science Advisory Committee and its Panel on Environmental Quality. As a result of these meetings it was decided that the ACS could serve a useful purpose by selecting the more important of the recommendations, updating them, and putting them in order of priority for immediate action. This has now been done in the form of a supplement to the original document. It contains twenty-six recommendations, along with updated supporting discussion, and was published in 1971.

Before discussing these recommendations I would like to place this discussion in perspective regarding ecology and environmental science. Ecology is that branch of science concerned with the interrelationship of organisms and their environments. The scientists who wrote the two ACS documents in fact had very little to say about ecology as such. Their attitude can be summed up with a brief quotation:

Several problem areas emerge as explicit themes in this report. One such theme is the primitive condition of our fundamental knowledge of how living things are affected by long-term, low-level exposure to pollutants.

Partly related to this theme is a second, the even more primitive condition of our knowledge of the effects of pollutants on the ecology, that is, on the aggregate of living things as they exist together in nature. The relationship of contaminants to the ecology is very nearly a total mystery, and scientists are just beginning to study ecosystems on the multidisciplinary basis that is clearly required.<sup>3</sup>

These statements certainly were not saying—nor am I saying—that ecologists know very little about ecology. They were saying that the ecological effects of specific contaminants simply are not well understood. That situation

needs to be corrected, and we have so recommended. As a consequence of the existing situation, however, the recommendations I will discuss deal only sparingly with ecological effects.

I should also mention two other characteristics of the twenty-six recommendations in the ACS supplement: (1) we have not concerned ourselves to any degree with administrative questions; and (2) we have tended to favor areas in which defects in our knowledge must be corrected by further research and development. We have not, for example, made any recommendations related to the lead in gasoline. Our original document included such a recommendation, but our experts believe that sufficient momentum has since developed in this area to obviate the need for further recommendations at this time. It appears, furthermore, that the problem of lead in gasoline can be worked out on the basis of *existing* knowledge. That being the case, the problem does not appear to require further intensive research and development.

The ACS scientists see no decline in the importance of four overriding themes that were evident in our original document. I have already mentioned one of these—the primitive condition of our knowledge of how living things are affected by long-term, low-level exposure to contaminants.

The second of these overriding themes is the fact that we have a very large amount of existing knowledge that can be applied today to environmental problems. All that is required is sufficient effort and money—although getting the money is not a simple task. Low lead and no-lead high octane gasolines are made using existing knowledge. Sewage treatment plants are built on the same basis.

The third overriding theme is the inadequacy of many of the analytical chemical methods that must be depended on to monitor, to control, and to study the environment and the related phenomena. Better analytical methods are needed in several areas, including global air monitoring, ecological research, and the study of trace metals in water and of eutrophication.

The last of the four overriding themes is the lack of the sort of data needed to define normal trends, upward or downward, in the concentration of contaminants in the environment. For most contaminants, we simply have no reliable baseline concentrations.

With those overriding themes in mind, I will discuss the twenty-six specific recommendations of the supplement. I will not cover all of them in detail, but I will try to indicate the thrust of most of them as well as some of the thinking involved concerning them.

For the air environment, first was recommended a program of systematic measurement of a number of relatively long-lived substances in the general atmosphere. These substances include carbon monoxide, nitrous oxide, methane, carbon dioxide, fluorocarbons, and sulfur hexafluoride. Systematic

measurement of the general turbidity of the atmosphere was also recommended. The point of these recommendations is that we really have no sound idea of which air pollutants (except carbon monoxide) are truly worldwide in scope. To get such data would require that a program of the type recommended be continued for several decades. We think that a network of twenty to thirty monitoring stations, worldwide, could do the job. We foresee a total initial cost of about \$300,000 and a total long-term operating cost of up to \$200,000 per year.

Another problem seen is that the complete pollution envelope of a single city has never been studied in what we believe to be adequate detail. This fact poses a serious problem to logical planning of environmental management of the air resources. One recommendation is that the air pollution of a single city should be studied intensively in all of its ramifications—chemical, meteorological, and biological. A diversified group of federal and other agencies has planned such a study for St. Louis, Missouri, but the problem is obtaining funds. The project could cost up to \$30 million or even more. This is a great deal of money, but ACS scientists believe that such a study is absolutely essential to breaking the bottleneck of piecemeal information about urban air pollution. We believe that the results of such a study could be generalized to most cities in the world and would provide an invaluable base of data for the future. This study is now underway.

I have already touched on the ecological effects of pollutants. Our recommendation on this point calls for an integrated, carefully coordinated, multi-disciplinary research program on the ecological effects of air pollutants, with a strong input on water and soil contaminants as well. A great deal of work is required in this area. The effects of pollutants on individual plant and animal species have been demonstrated under controlled conditions, but in no case has such an effect been traced through to its final impact on an entire food chain.

A good deal of momentum has developed in the control of automotive pollution. For this reason our priority recommendations retain only one of the recommendations in this area that were made in the original ACS document. That recommendation calls for the development of improved instrumentation for analyzing motor vehicle exhaust. We see a serious problem in the lack of economical means of doing such analyses. The exhaust emission control devices installed on new cars today do not operate properly unless adjusted regularly. National Air Pollution Control Administration data have shown that too many cars equipped with such devices begin to exceed their certified emission limits when they have been on the road for a while. One of the difficulties is that when the devices are adjusted, the effects on the exhaust gases are not checked. One reason is that the necessary equipment costs several thousand dollars—more than either garages or state inspection

stations can usually afford. The problem will grow more serious as the allowable levels of exhaust emissions decrease, which they must to meet the standards of the mid-1970s.

A second problem exists with routine exhaust emission checks. One obvious time to make such checks, of course, is during routine auto safety inspections. But as of fall 1971, only about thirty-one states required such inspections. One of them was Colorado, which has some 3,700 authorized inspection stations. We do not believe that effective periodic emission tests could be made at that many stations at any reasonable cost.

The combustion of fossil fuels in stationary installation poses a number of difficult environmental problems which can be classified in terms of particles, sulfur oxides, and nitrogen oxides. The technology of removing particulate material from stack gases is relatively well developed, and we made no recommendation on the topic. In power plants, as the sulfur content of the coal goes down, particulate matter becomes more difficult to remove with electrostatic precipitators, but it can be done.

A considerable effort is underway on the sulfur oxides problem, but there still is no commercially proven technology for controlling sulfur oxides produced in combustion processes. The ACS scientists have recommended further stimulation of first generation processes, particularly to provide control options for existing power plants.

For small, stationary combustion sources, and in some cases for large ones, the sulfur oxides problem might better be solved by shifting to fuel of low sulfur content. Low sulfur coal and natural gas are limited resources, and probably they should be reserved for use where no economical alternative exists for controlling sulfur oxides as in individual homes. Fuel oil is being desulfurized, and more of that will undoubtedly be done, but heavy fuel oil today accounts for only an estimated 12 percent of the sulfur oxides emitted by stationary sources. The major problem is coal, which accounts for an estimated 65 percent of such emissions. The problem seems likely to grow steadily worse, unless our living habits change markedly, since the use of coal to generate electricity is expected to triple by the year 2000. At any rate, we have recommended a strong development effort on processes for desulfurizing fuels, particularly coal. We call also for more thorough definition of the amounts and locations of coal that can be cleaned economically of pyritic sulfur.

Nitrogen oxides emissions come almost entirely from combustion, and about a quarter of the total originates in steam-electric power plants. The latter figure is rising steadily, of course, as production of electric power increases. Nitrogen oxides emissions in power plants might be reduced relatively easily by modifying the combustion process. We have recommended that conclusive data be developed on the economics and effectiveness of such

modifications. We have also recommended a comprehensive research and development program on the abatement of nitrogen oxides emitted by stationary sources. The processes that do exist for this purpose are still in the laboratory.

Besides these recommendations aimed at specific emissions from stationary sources, the ACS supplement calls for two broader measures: (1) the needs of present and future urban areas for low pollution fuels for space heating should receive due consideration in the development of national fuels policies and inventories; and (2) the economics of centralized production of heat for space heating should be thoroughly evaluated. Heat energy might be distributed in the form of hot air, steam, or high-pressure hot water. The point, of course, is to combine a number of small stationary combustion sources into a single large source whose pollutant emissions can be abated economically.

ACS foresees the distinct possibility of an electric power crisis in the United States as a result of the limited supplies of low sulfur coal, oil, and gas; the desirability of reserving natural gas for small users; and the lack of methods for abating nitrogen oxides. Gasification of coal at the mine should be able to produce large amounts of relatively clean-burning pipeline gas when existing technological problems are solved. The use of nuclear energy should continue to grow, providing problems with radioactivity and thermal discharge can be resolved; the latter being, of course, a growing problem for conventional power plants as well. Because of these two problems—thermal pollution and radioactivity—it is not too extreme to suggest that one day we may find ourselves turning to solar energy for much or most of our power. Meanwhile, we have our work cut out for us in minimizing the environmental impact of continued combustion of fossil fuels.

The ACS supplement makes five priority recommendations on the water environment. The first of these is that our methods of treating public water supplies should be upgraded. For fiscal 1970, less than \$160,000 in federal support was available for research on the treatment and distribution of public water supplies. We believe that a minimum of \$2 million per year should be budgeted for research on treatment of public water supply and on the effects of the quality of public water supplies on human health.

There is a good deal of excitement over mercury, cadmium, and certain other metals in water. The fact is that virtually nothing is known about how these metals are affected by the processes normally used in public water supply treatment plants. The fate of viruses and the effects of disinfection on viruses and other organisms in such a plant are open questions. These plants often draw their raw water from a source that receives treated waste water. We need to do more research on the removal or destruction of low concentrations of harmful substances and organisms that now pass through the waste treatment process unchanged or whose fate in the process is unknown.

Our second recommendation on water calls for expanded and accelerated research on eutrophication. A number of studies of the subject are underway, but our fundamental knowledge of the chemical and biological processes involved is well below the level needed to develop sound, long-range control measures. More must be learned in several areas: mass balances for significant nutrients in specific lakes and rivers; the forms in which these nutrients exist in water; the dynamics of natural plant and animal populations; potentially limiting nutrients in specific situations; and the physiology of the relevant algae, bacteria, and plants. The debate of the past few years over detergent phosphates certainly owes some of its less rational features to various kinds of politics, and sounder fundamental knowledge of the process of eutrophication might help to produce more effective action with considerably less wheel-spinning.

The largest single cost in treating waste water lies in handling and disposing of the residual sludge, which can account for 25 to 50 percent of capital and operating costs. The sheer physical volume of such sludge is a problem in itself—Chicago alone produces more than 900 tons of dry solids daily. Nationwide, the amount of sludge produced will grow steadily as secondary waste water treatment becomes more common. As a result, we have recommended expanded research on new methods of handling sludges from waste water treatment. Such research should include work on the fundamental process parameters involved in using synthetic polymers and polyelectrolytes to improve flocculation, sedimentation, and conditioning of such sludges.

One of the goals of water chemists is to be able to understand quantitatively the flow, dispersion, and degradation of water pollutants. To support such an understanding, more needs to be known of the specific chemical compounds in waste discharges and natural waters. Such information is also needed to support rational assessment of the pollutant potential of specific compounds on a local or regional basis. To ease these problems, we have recommended that inventories be made of pollutants from all sources known or expected to be important. We recommend that this be done on a selective, watershed basis. A comprehensive, nationwide study could consume a great deal of money and effort, and we may not be sophisticated enough yet in other scientific areas to be able to interpret the data collected.

Even a selective program of the kind recommended might have turned up the mercury pollution that suddenly has become a recognized hazard. Another problem is organic compounds: one of the relatively few analyses that has been made of domestic sewage could account for only 75 percent of the organic carbon. The number of synthetic organic chemicals that can enter the environment is growing rapidly: one estimate puts the rate at more than 500 per year.

The ACS supplement's last recommendation on water calls for the assembly of comprehensive information on the technology of joint municipal-

industrial treatment of waste waters. This information then would be made widely available to companies and municipalities which might wish to consider joint treatment.

The same technology often can be used to treat municipal and industrial waste waters, and joint facilities tend to ease the overall cost of treatment. Indirect evidence suggests that a trend is developing toward more joint treatment. Among the technological problems is the fact that normal municipal secondary treatment processes may not be able to handle the high biochemical oxygen demand found in some industrial wastes. Such problems can often be solved, and data for 1968 show that municipal sewage treatment plants treated approximately equal volumes of municipal and industrial waste waters.

The four ACS recommendations on solid wastes involve mainly existing capabilities, and we have said little that has not been said before. The recommendations could be implemented simultaneously and very nearly as rapidly as the necessary resources could be mobilized. Solid wastes are not inherently mobile—unlike air and water pollutants—and they tend as a result to be a local problem. A large part of that problem is simply the difficulty of persuading the responsible parties to pay for what needs to be done.

In any case, our recommendations stress the continuing need for education, research, demonstration, and local and regional planning for solid wastes management, utilization, and disposal. Continuing effort also is required in methods of collecting and transporting municipal solid wastes; these functions typically account for about 80 percent of the cost of the total waste disposal system. We also see a need to encourage and support the use of known peripheral science and technology in developing improved methods for sanitary landfill and incineration. Composting has succeeded economically in only a few instances, but we believe its true potential could be assessed more accurately if the process were put on a more scientific basis. This is particularly true of the biochemistry of the degradation process.

Our recommendations on solid wastes also cover junked automobiles. Disposal of discarded vehicles appears to be largely a problem of using technology to produce a marketable scrap at a reasonable cost. Our recommendation deals with the several aspects of this problem: transportation, processing equipment, air pollution control equipment, and the demand for higher quality ferrous scrap.

The fourth and final section of the ACS supplement concerns pesticides in the environment. Our first recommendation on pesticides calls for an extensive program of education, at all levels of government, to teach all users of pesticides the optimum methods of pest control. Considerable progress in the more intelligent use of pesticides can be made by starting such a program at once.

Optimum methods of pest control involve careful integration of chemical, biological, and cultural methods. As far as chemical methods are concerned, contamination of the environment can be reduced by using better application techniques and formulations; by applying the available knowledge of the effects of pesticides on insect parasites and predators and of population dynamics; and by using eradication techniques such as release of sterile males. Economic control of pests on crops and animals can be achieved in this way with minimum environmental and ecological impact. To implement such concepts, however, requires extensive education among research workers, extension and regulatory entomologists, and farmers.

The ACS task force recommends that persistent pesticides be used only in minimum amounts and under conditions where they have been shown not to contaminate the environment extensively. By "persistent" pesticides is meant those whose concentration tends to be magnified in the food chain. We do not mean those that are designed to provide, let us say, season-long protection against particular pests. The persistent pesticides include mainly the chlorinated hydrocarbon insecticides such as DDT.

The actions taken by the U.S. Department of Agriculture and, later, by the new Environmental Protection Agency, should deal effectively with persistent pesticides. Continued attention should be paid, nevertheless, to pesticides that are magnified in the food chain. We recommend that current programs of monitoring pesticide residues in all phases of the environment be continued. We see no reason to expand the monitoring program on human food, but we do call for expansion of the monitoring programs on air, water, soil, and wildlife. We recommend also the development of better methods for separating and determining minute amounts of pesticides in air and water. Until this is done, it will not be possible to expand the existing monitoring programs.

Biological and chemical methods of pest control are being studied extensively, and such work should be continued. We believe also that chemical methods should be integrated into such research programs, since we visualize future pest control as using optimum combinations of biological, chemical, and other tools.

The ACS considers it extremely important to do more research on the relationship and interaction between environmental pesticide contaminants and biological systems. Many conclusions on the effects of pesticide residues on biological systems are based on circumstantial evidence only. It is important to confirm or refute such conclusions by doing the experimental work required to establish definite cause and effect relationships. The original recommendation on this score dealt only with wildlife. Its importance is such, however, that it has been broadened by replacing "wildlife" with "biological systems." Humans have been harmed, sometimes fatally, by most of the highly toxic pesticides as a result of accidents and misuse, and such episodes

are relatively clear-cut. Not so clear-cut is the task of evaluating the effect on humans and other forms of life of exposure to relatively low levels of many pesticides in the environment and in the body itself. We have recommended continued research on the impact of long-term, low level exposure to pesticides on humans and other forms of life. We see a particular need to study the dose-response relationships of pesticides that are suspected of being carcinogenic.

One characteristic of the ideal pesticide is that it should be specific—as effective as possible against its target organisms, as safe as possible to all other forms of life. We are not fully exploiting today the specificity of a number of existing pesticides, but we do see a need to develop still more specific compounds. The last of our recommendations on pesticides calls for further research on more specific compounds, which can help greatly to decrease both environmental contamination and undesirable side effects.

I do not believe that the ACS people who worked on the original document on environmental chemistry, and on the supplement just described, will claim that either contains a profusion of brilliant insights. What we *did* set out to do was to produce an objective treatment of the subject in language that the educated layman could understand. We believe this is the kind of service that scientific and engineering societies such as the ACS are uniquely qualified to undertake. They have the intellectual resources at their command. They are in a position to organize them so as to cancel out individual and institutional biases to a very large extent.

The experience of ACS in the development of this report has led to some organizational changes which will place it in a better position to more effectively respond to environmental challenges, both on a technical basis and on a policy development level. The Committee on Chemistry and Public Affairs will continue to exercise its responsibility in the development of policy recommendations in the field of environmental improvement.

In 1970 the society established a new Joint Board-Council Committee on Environmental Improvement. This committee is responsible for the coordination of the internal technical programs of the ACS relating to the environment. One of the initial projects of this new committee calls for the establishment of an extensive information center and technical clearinghouse on the environment. This center will accumulate and disseminate information on the nature of the problems and questions being raised about the environment, house a compilation of established areas of ACS competence in the field of environmental improvement, and maintain a file of experts in the field, cross-referenced with their areas of competence.

A second phase of this project is the establishment of a series of panels to provide technical, investigative and research assistance in specific fields. This effort will be coordinated through the ACS technical divisions most directly involved in environmental work.

The environmental improvement report is considered by many members familiar with the ACS's achievement record as one of the most significant accomplishments in its history. ACS leaders regard the report and the organizational changes described above as the starting point from which the ACS is launching full scale into the task of seeking chemical solutions to the world's environmental problems.

The Committee on Environmental Improvement is now beginning to prepare a second edition of *Cleaning Our Environment—The Chemical Basis for Action*. The new report will be expanded to include not only chapters on air, water, solid wastes, and pesticides, but also chapters on toxicology, energy, analysis and monitoring, and radiation. The new report is expected to be ready for publication in 1974 and will be a five-year update of the 1969 report and will broaden its scope considerably.

Other ACS activities which serve as environmental science resources include the Chemical Abstracts Service, the Advances in Chemistry Book Series, tape recordings dealing with pollution and with solutions to environmental problems, and the "Men and Molecules" radio program.

*Chemical Abstracts* is a weekly journal containing abstracts of documents relevant to chemistry and chemical engineering. The *Chemical Abstracts* orientation to environmental problems is fundamentally chemical. Coverage of these topics is confined to substances and their relation to, or interaction with, the environment. Environmental effects of other agents (heat, noise, vibration, light) are included in *Chemical Abstracts* coverage only if they, in turn, cause a chemically related effect on the environment. Chemical effluence from an industrial plant is covered in *Chemical Abstracts*. However, thermal discharge from an industrial plant, whether a chemical industry or not, is covered only if the study is extended to include resultant chemical effects upon the area influenced by the discharge. Although *Chemical Abstracts* covers the theory and technology of heat exchange and heat exchangers as they relate to chemical engineering, coverage is extended only to related chemical effects on the environment but not to effects on the environment per se. *Chemical Abstracts* will cover an estimated 20,000 abstracts annually related to chemistry and its environment. This represents about 5 percent of the total chemical abstracts.

The ACS Advances in Chemistry Book Series are the published form of symposia presented at the American Chemical Society meetings. Many of these symposia provide a broad picture of the progress in various fields of environmental research and development. The books make this information widely available, and include references for each paper.

The Committee on Chemistry and Public Affairs initiated, in 1966, a series of public issue and policy symposia at ACS national meetings in order to broaden the spectrum of member interest and responsibility. This program

has been quite successful in catalyzing other units of the ACS, and we now have a growing program of public and professional symposia (many dealing with environmental problems) in addition to the strictly technical papers presentations. Most of these public interest symposia are tape recorded and have received wide distribution and are available upon request. Feature articles on these symposia also appear regularly in *Chemical and Engineering News*, ACS's weekly news magazine, and multiple copies of the reprints are available for distribution.

"Men and Molecules" is the ACS's 15-minute weekly radio program heard on more than 400 stations across the country. It is primarily an interview program which concentrates on a continuing report on current issues in science by the leaders in various fields. Increasingly, leaders in the environmental field are being heard on the program. This program is available on audio cassettes by subscription.

Finally, I should mention the ACS short courses in chemistry and chemical engineering. More than forty different courses are now available. They are concentrated, naturally, in the classical chemical fields, but in the last few years interdisciplinary subjects have been covered. A specific series of courses dealing with pollution control and environmental science are now under development. These courses are conducted in the traditional manner and also in the form of individual and group audio courses. Research and development is also being carried out on videotape short courses.

In summary, the ACS recognizes a responsibility as a scientific and educational organization to marshal its total intellectual and physical resources to effectively contribute to the solution of public problems such as the environmental issue.

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## Getting Down to Earth: The Call of Stockholm Upon the Information Services

Attending the United Nations Conference on the Human Environment at Stockholm was an exhilarating but sobering experience. No one who was there, including the sharpest critics of faults and omissions, doubts that the Stockholm Conference was an epochal incident which will mark a major turning point in the history of man and the earth.

The Stockholm Conference was distinguished as an "action" meeting. It was planned during the years of intensive preparatory work to have a clearly stated, well-considered agenda and to be ready to produce concrete proposals upon which action in the environmental interest could be based. As a result, an overall Declaration on the Human Environment<sup>1</sup> was adopted by the 114 nations represented at the conference. The declaration embodied twenty-six principles and a series of 109 specific recommendations for action to tackle the environment problem, not simply to talk about it.

What did the Stockholm Conference do? Unfortunately, many people think that United Nations meetings produce only an exchange of views bounced back and forth in a vacuum of do-nothingness. One reason that Stockholm was so heartening and significant is that it disproved this misconception. The conference called on information specialists to get down to earth with their expertise and work to disseminate the needed information on the subject of the earth as the human environment. The conference approved a plan for a permanent environmental secretariat high in the United Nations structure as a focal point for action and coordination. This is an international development equivalent to the establishment in the United States of the Environmental Protection Agency—an agency providing a central point of responsibility to public opinion where information, suggestion, complaint and

demand can at the very least be presented for hearing. The Stockholm Conference also called for a 54-nation Governing Council for Environmental Programs to set policy and promote international cooperation.

As the result of Stockholm, there will be a United Nations Environment Fund to finance international environment protection measures. The fund is not nearly as large as it should be, but it is a beginning, and something that certainly was not available before.

The conference voted to establish a worldwide "Earthwatch" to monitor the condition of the atmosphere, the oceans, the land, and human health. For the first time an international referral service will be established to serve as a source of information open to all countries to provide for exchange of information and support research, and legislative and planning programs in the search for solutions to the environmental problem. The U.N. General Assembly approved the Stockholm recommendations on December 15, 1972.

The work of the IBP and the FAO in gene research has come to fruition and there will be a worldwide program to safeguard the world's immense variety of plant and animal genetic resources, many of them already endangered, so that man can draw upon them in the future for food and fiber, science and satisfaction.

Additionally, the conference urged completion in 1972 of a global convention to restrict ocean dumping; recommended steps to minimize release of such dangerous pollutants as heavy metals and organochlorines into the environment; called for early completion of conservation conventions, including the World Heritage Trust for natural and cultural treasures and a convention restricting international trade in endangered species; urged steps to adjust trade and development considerations between developing and industrialized countries to promote environmental protection and assure equity of treatment; recommended higher priority for environmental values in international development assistance to give more emphasis on conservation, land use planning and quality of human settlements; urged greater emphasis on population policy and accelerated aid to family planning in countries where population growth threatens environment and development goals.

Stockholm was a time of reassessment, at the highest level of international debate, of man's true relation to his environment; of man as part and component of the biosphere, sharing the life and the lifegiving elements of that biosphere with other living organisms and having no natural mission or right, either as species, national community, corporate enterprise or individual, to the monopoly of any part of it. This time of self-examination has been compared to that when Copernicus showed that the earth does not stand still at the center of the cosmos, but is a planet moving in space in a fixed relationship with other planets.

No direct inconvenience to the average person resulted from the leak of

the Copernican theory to public knowledge. Doctrinally the theory was denied, and for 202 years, from 1633 to 1835, was on the Index list of forbidden books. In practice, science went forward from the new platform of knowledge provided by Copernicus and Galileo, who confirmed the Copernican findings, without waiting for theological formality to catch up. Popularly, however, the earth still looked to man like the biggest thing in the universe, inexhaustible and indestructible. Today, man has seen the earth from the blackness of outer space. The popular mind has grasped, from photographs, that the earth is quite small, as Copernicus said. The view from space, moreover, does not show national boundaries, as the Canadian Secretary-General of the conference—Maurice F. Strong—pointed out in the opening session at Stockholm, any more than it shows lines of longitude and latitude; such artificial demarcations must all be classed together as instruments of definition—not enclosing walls. While they usefully protect identity and pinpoint locations, they do not stop the flow of rivers, ocean currents, wind, rain and clouds or any other natural phenomena which affect the life of the human species and the health and functions of its earthly home.

To this epochal change of view, the Club of Rome, composed not of scientists but representatives of giant industrial enterprises, using not only the human brain but the electronic computer, brought confirmation just before the Stockholm meeting of what the environmentalists from George P. Marsh to Rachel Carson have been trying to tell us—that the resources of the earth, its land, seas and subsoil, are finite.<sup>2</sup> Its capacity to withstand exploitation and quantity production, to absorb waste, to sustain human life has limits; those limits are being approached faster than we think because the principle of exponential growth applies. Technology can delay but will not stop it. The United States's national report to the Stockholm Conference acknowledges that "growth must be redirected."<sup>3</sup> The Declaration of the Nongovernment Organizations at Stockholm declares that "both in production and physical consumption the world economy must come to be in balance with environmental carrying capacity. Exponential growth is possible [within earth's finite limitations] only in the realm of the mind and spirit."<sup>4</sup>

It has taken a relatively short time for these colossal and revolutionary concepts to get into the popular awareness. Thanks to the flow of information and the transmittal of the picture story around the world, popular knowledge keeps very much apace with scientific discovery, even in remote places.

This does not mean that the average individual, in either industrialized or developing countries, is prepared to judge or readily accept the meaning that this new knowledge may have in relation to him. Many will take refuge in doing nothing and hoping that the depersonalized and unregulated technology which got us into the mess will get us out again and, what is more, help us not to feel it by administering laughing gas. As Strong noted at one point, quoting Pogo, "We have met the enemy and he is us."

Principle One of the Stockholm Declaration on the Human Environment is "to improve the environment for present and future generations." It is the very essence of the American dream to hold that all of us work, strive and make sacrifices so that the world can be a better place for our children. Yet if the dream goes on much longer in its present form, the heritage will be a scorched earth left to a crumbling society. In our haste to develop nuclear energy rather than cut back on some needless waste of the resources we have, we are passing on to our children problems of handling nuclear waste that are so dangerous we do not know how to start coping with them ourselves. In our insistence on putting tax values before social and aesthetic values of land use, we leave millions of American children without contact with nature. The danger already exists that they will mature accepting a scorched earth as the normal frame of life. Many are already so conditioned: where there are no parks, no trees, no open spaces except those devoted to piles of rubble and plastic trash, where the only mammals are rats, where there are no birds, no ponds, no butterflies, it is no surprise that our young grow up with no nobler idea of the magnificence of nature than a Disneyland, or of acting naturally than by going barefoot on a dirty sidewalk.

Rethinking the goal-structure and the bases of our economic and social order is indeed a painful ordeal, yet we have already made progress toward the necessary reshaping of our view of the relation of man to earth and its community of living things. We may find that the worst of the trauma for the affluent society was the shock of discovering that we have to face it.

It is precisely to bridge the gap between the real facts and the individual response, so that people living under democratic systems can cast their votes on measures affecting environmental policy, that provision for an adequate flow of information becomes of vital necessity.

A first priority to meet this need, as illustrated at the Stockholm Conference, must be accorded to face-to-face contact between the scientists, decision-makers and all concerned men and women through the agency of voluntary organizations. But the discussion groups cannot succeed or go from talking to logical action without the back-up service of research, information support and dissemination.

The mandate of the U.N. conference was to "focus world attention on the global environmental crisis and identify specific actions that could be taken through international cooperation and agreement, while recognizing that the major responsibility for environmental protection still rests with individual nations."<sup>5</sup> This mandate was fulfilled both in the preparations and the conduct of the conference. In 1968, the U.N. General Assembly decided to hold the conference. Two years of work were carried out by a 27-nation preparatory committee and a small U.N. staff under the able leadership of Maurice Strong. The president of the conference, who proved to be a skilled

and knowledgeable presiding officer, was Ambassador Keith Johnson of Jamaica. In the two years of preparatory work, assessments and reports of their own environmental problems were produced by more than 70 countries, plus 120 background papers from U.N. agencies, governments, and scientific, technical, and conservation-environmental organizations.

The collective and individual preconference efforts added up to the most comprehensive compilation of environmental information ever assembled. It constituted the first systematic review of the condition of the world environment. Approximately 14,000 pages of documentation were then condensed to 700 pages of exposition and recommendations for consideration at Stockholm.

Special attention should be given to the fact that all but one of the country's reports were produced by national writers from each nation's own research resources, not by teams of foreign observers. The developing countries in particular are justified in taking great pride in these noteworthy studies. Much credit is due to Secretary-General Strong for the stimulating encouragement he gave to the national reporting effort. He was one of the few people to globe-trot preceding the conference. This placed an enormous demand on his energies, but surely helped as nothing else could have to shape task forces and delegations, backed by the necessary support from nongovernmental bodies, which went to Stockholm already unified in purpose and prepared for action.

No time was lost in debate on the central assumption that the human environment is endangered, and that man himself can become an endangered species, due to the effects on the biosphere of pollution generated by man's activities. The conference addressed itself, rather, to consideration of human settlements as the foci of the land-use and management problems involved, to consideration of the nature of polluting factors and substances, the methods of detecting, measuring and tracking the movement of pollutants across national boundaries and into the seas, the responsibilities of nations in this regard, and the kinds of action that can be recommended and initiated within the structure of international organization. The obviously pertinent subjects of population and marine pollution per se were deferred for study in previously scheduled U.N.-sponsored conferences. The U.N. Conference on Population will be held in 1974 and the International Conference on the Law of the Sea is scheduled for 1973.

In attendance at the conference were official delegations from 114 countries, representatives of more than 500 nongovernmental organizations concerned with environmental and socio-environmental problems and a press corps of more than 1,400, the largest ever present at a U.N. meeting.

Supplementary to the conference were a Distinguished Speaker Lecture Series, in which such important figures as Thor Heyerdahl participated, and an Environment Forum, where there was an excellent library with motion

pictures and exhibits, and where protagonists of a great range of causes they deemed related to the conference theme had their opportunity to take the floor.

With few exceptions, those who went to the conference in any role went there to work. Their hard work was shown by empty seats at gala performances of the Royal Opera in honor of the delegates—seats unoccupied because the ticket-holders were working in all-night drafting sessions, revising and resharpening official statements. This kind of effort went on at all levels throughout the eventful two weeks of the gathering.

Lack of knowledge has brought the world to a state of environmental crisis, and librarians must bear their share of the blame. In 1853 at a convention of librarians in New York, the first system of exchange of information on a worldwide basis was proposed. This proposal was never implemented and only recently in the plans for World Science Information System (UNISIST), which is just now becoming operational, has any serious attempt been made for such a system. In 1864 George Marsh, in *Man and Nature*,<sup>6</sup> described civilizations that had decayed and fallen because of the mistreatment of their physical environment. In 1963 James Morris, in *The Road to Huddersfield*,<sup>7</sup> described the ecological damage of industrialization. How many of us have read these books or have them in our libraries? Even today Rolf Edberg's book, *On the Shred of a Cloud*,<sup>8</sup> which has been credited as the inspiration for the Stockholm Conference, is classified in the Library of Congress under Swedish literature with no subject headings; anyone seeking an environmental classic would never find this book. It is only recently that the word "environment" has found its way into the various indexing and abstracting services, and the coverage is still extremely limited.

At Stockholm all the demands for information in the preconference documents were boiled down to a very modest proposal for an international referral service. The origin and conference action on this service are described in an article in the September 1972 issue of *Special Libraries*.<sup>9</sup> Therefore I will treat other information aspects of this conference and some other activities with which I am familiar.

Within the 109 recommendations for international action, 66 asked for exchange of information, 53 denoted areas for further research, and 30 indicated specific needs in training and education. All of these are dependent on libraries to fulfill their objectives, yet the word "library" or "librarian" is never mentioned in the entire document. What is the reason for this neglect? It can partly be traced to the world's love affair with technology when services were subordinated to machines, and labor-intensive industries were neglected for capital-intensive. Now that these trends are being questioned, true library service has a chance to be useful as never before.

The recommendations for the promotion of public information demand

the services of public libraries. Recommendation No. 96 states: "International agencies concerned . . . should . . . take the necessary steps to establish an international programme in environmental education, interdisciplinary in approach, in school and out of school, encompassing all levels of education and directed toward the general public, in particular the ordinary citizen living in urban and rural areas, youth and adult alike, with a view to educating him as to the simple steps he might take within his means to manage and control his environment."<sup>10</sup> Recommendation No. 97 states: "To establish an information program designed to create the awareness which individuals should have of environmental issues and to associate the public with environmental management and control. This program will use traditional and contemporary mass media of communication."<sup>11</sup> These are functions many public libraries are providing and every public library should provide. Particularly in the less developed countries and in rural areas, public libraries are agencies of mass communication. We should return to the concept of the library as the people's university.

Recommendation No. 102 on setting up the governing council instructs this council to insure the utilization of relevant scientific and other professional communities throughout the world in the collection, evaluation and exchange of information. Here are opportunities for library associations to take an active part in programs that consist of something besides talking among themselves. There were only four librarians among the thousands of delegates and observers at the Stockholm Conference. Yet, throughout the conference, one of the strong themes was the role of the nongovernmental organizations and the need for their support and assistance in promoting any program for environmental improvement. Curtis Roosevelt, chief of the NGO section at the U.N., points out that the present atmosphere in the United Nations system indicates that the time is ripe for NGOs to press for a more productive relation; at stake is the right of citizens to make officials aware of their needs and desires. At a briefing by the American delegation, the officials, including Russell Train and William Ruckelshaus, stressed the need for public participation, for citizen action, and for interrelations with foreign colleagues.

Since Stockholm, the NGOs have been meeting in Geneva and New York to find ways to deepen and strengthen the relationships between the NGOs concerned with the environment, and to find ways to assist and strengthen the environment secretariat. Anyone interested in joining this effort is welcome. The United States group is being supported by the Community Development Foundation (345 East 46th St., New York, N.Y. 10017); by writing to President Glen Leet one can be placed on the mailing list for notices of meetings and other actions.

There are a few signs that librarians and educators are becoming aware of these needs and opportunities. The Special Libraries Association is follow-

ing closely the recommendations regarding the international referral service and is planning input into one of the working groups. At the annual meeting of the American Society for Information Science in October 1972, Marta Dosa described a seminar at the School of Library Science at Syracuse on information problems in environmental studies.<sup>12</sup> Let us hope that the graduates of that course are already putting to work the excellent methods taught.

Now let us look at some other international environmental activities. The U.S. Senate, recognizing the need for environmental information, requested the Congressional Research Service of the Library of Congress to prepare a list of international organizations concerned with environmental problems. The result is entitled *The 1972 Survey of Environmental Activities of International Organizations*<sup>13</sup> and is probably the best and most up-to-date source for information on environmental programs of these institutions; it demonstrates that environmental information does exist if one takes the trouble to find it. The survey covers the United Nations, the specialized agencies and other U.N.-related organizations, official intergovernmental organizations, and nongovernmental organizations having environmental orientation. Each of these organizations issues documents, and many of them have catalogs of their publications which are usually free to libraries. The information on each organization in this document is brief, and I have singled out a few programs to talk about in more detail.

The first of these is the International Biological Programme, a worldwide study of biological productivity and human welfare launched by UNESCO in 1964 and projected for ten years. Each participating country (about sixty) sets up its own organization and chooses its projects, but these must be approved by a central committee. On approval, the national committee seeks funds from its own government. In addition, each participating country pays dues to the program. These range from a very modest \$100 from Nigeria to the still modest (considering the need) \$25,000 from the U.S. The program has already produced national reports from each country, handbooks of methodology (which are being used as college texts), journal articles and bibliographies. All of these are distributed to each participating country. All projects will be synthesized and the results published by Cambridge University Press. The more detailed national volumes will be abstracted and also published by that press.

Growing out of IBP is another UNESCO project, Man and the Biosphere. This is a governmental program and includes research in the social as well as the natural sciences. Its objective is "to develop the basis . . . for rational use and conservation of the biosphere for the improvement of the global relationship between man and the environment." The first meeting of the coordinating council took place in November 1971, and before Stockholm

the project had already produced a number of documents. These are distributed to governments and are for sale at any UNESCO center. The objectives are those of Stockholm, and some of the MAB funds will come from the environmental secretariat.

Another program growing out of IBP is the Program for Analysis of the World Ecosystem. This is to be undertaken by the Scientific Committee on Problems of the Environment of the International Council of Scientific Unions. It differs from MAB in that the latter is governmental and human-oriented. PAWE will give a continuing opportunity to scientists for independent research into the fundamental relations between man and the environment and more deeply into such processes as biological productivity and energy. The funds will come from MAB and probably from the environmental secretariat, as well as from private funds in each country. This program has not yet produced any documentation.

A national program, but with international resources and implications, is the Smithsonian's Science Information Exchange. SSIE is a voluntary program for the collection and dissemination of interdisciplinary information in ongoing research. It provides a central clearinghouse with uniform indexing regardless of the source of material. It annually collects approximately 100,000 records of research projects. Each record outlines who supports the project, who is performing the work, where and when it is taking place. It will conduct searches against this collection on any topic and provide copies of all pertinent records. In addition, it makes its own searches and publishes the results on frequently requested topics such as the environment. For example, a recent project was concerning the effect of population growth on the environment. It also publishes complete catalogs on request. One of the most recent of these is the *Environmental Protection Research Catalog*<sup>14</sup> which includes many international cooperative projects. The service is expensive but it is unique and will provide information that is available nowhere else. A subscription to the *SSIE Science Newsletter*, which is inexpensive, alerts one to new topics being searched.<sup>15</sup>

A similar service for report literature has just been started by the National Technical Information Service from its vast store of government-sponsored research completed. Requests can be in the user's own language or in any of the regular NTIS categories, geographically as well as by subject.

Another theme of the Stockholm Conference was that for many environmental problems, solutions would be found in regional action, since much valuable work is being done in the regional organizations. These, in general, are described by Robert Stein in *The Potential of Regional Organizations in Managing the Human Environment*.<sup>16</sup> I will discuss several in more detail. One is the Committee on the Challenges of Modern Society of the North Atlantic Treaty Organization. NATO is following its mandate in Article

2 of the treaty establishing the organization, which binds the parties to promote "conditions of stability and well-being." In November 1969 CCMS was established to examine ways of improving and creating a better environment and for the exchange of views and experience in working toward this task. This organization is unique in that nothing is done by the secretariat—all work is done and paid for by member countries. The countries agreed on a number of pilot projects and either volunteered or were selected to carry out these projects. For example, the U.S. and Canada participate in the inland water pollution project and recently held an international symposium in Maine, where a new joint Canadian-U.S. committee was set up to provide a model for the overall project. One of the principal functions of the new committee is the exchange of information. Documents produced by CCMS are freely available to any library that requests them, although this sort of document is not listed in the usual indexes. Mailing lists are available from Gunnar Randers, the assistant secretary general for science at NATO headquarters, Brussels 1110, Belgium.

One of the most hotly debated topics at the conference was the question of development and the environment. Here the African countries have shown a great deal of astuteness, and in their national reports indicate their concern. Many of these countries believe that the primary environmental problems acute in the developing countries—e.g., health, nutrition and sanitation—should take precedence over what has been called the secondary environmental problems, those resulting from the processes of industrialization, urbanization, and population pressures. Others are seeking ways to prevent undue environmental damage from abroad. Raimi Ojikutu, a Senior Research Fellow of the School of African and Asian Studies at the University of Lagos and Secretary of the Nigerian National Committee for the IBP, is planning a seminar on the human environment in Africa. The aim of the seminar will be a dialogue between the varying African views and also between the African participants and environmental experts from other areas. One of the papers will be on international cooperation and information exchange among the countries of Africa on problems of the human environment; this paper will probably be presented by an African librarian. The seminar is currently only in the planning stage; but any proceedings emanating from it would certainly be a must for a university having an area studies program on Africa.

At the instigation of the Association of International Libraries, the U.N. Institute for Training and Research held a symposium on documentation of the U.N. and other intergovernmental organizations in Geneva, August 21-23, 1972, for which the proceedings will hopefully be published. In the meantime, the bibliography for the symposium, entitled *Documentation of the United Nations and Other Intergovernmental Organizations*,<sup>17</sup> may be purchased from

UNITAR (801 United Nations Plaza, New York, N.Y. 10017) for \$2.60. I would particularly recommend a paper in it entitled "United Nations Publications Outside Regular Distribution,"<sup>18</sup> by Elizabeth Nebhay, chief of the acquisitions section of the U.N. Library, which covers many of the problems all librarians are faced with in trying to obtain these documents. Similarly, the paper by Robert Schaaf, "International Documents at the Library of Congress,"<sup>19</sup> treats problems common to all American libraries.

Documents are not generated by inspiration of the author nor by considerations of commercial value or profit; they are created only in response to demand or by order of an individual or institution. If libraries create the demand, institutions are more likely to think it worthwhile to produce and to improve them. Many people today feel that too much documentation is being produced, that if officials would act more and read less, the world would be a better place. In this context, consider the Stockholm documentation—for example, the opening paragraph of the secretary general's report entitled "Problems of the Human Environment."

In the discussions held by the General Assembly at its twenty-third session it was emphasized that for the first time in the history of mankind, there is arising a crisis of world-wide proportions involving developed and developing countries alike—the crisis of the human environment. Portents of this crisis have long been apparent—in the explosive growth of human population, in the poor integration of a powerful and efficient technology with environmental requirements, in the deterioration of agricultural lands, in the unplanned extension of urban areas, in the decrease of available space and the growing danger of extinction of many forms of animal and plant life. It is becoming apparent that if current trends continue, the future of life on earth could be endangered. It is urgent, therefore, to focus world attention on those problems which threaten humanity in an environment that permits the realization of the highest human aspirations, and on the action necessary to deal with them.<sup>20</sup>

If U.N. documents are cataloged only as serials as at LC, these strong words are likely to go unnoticed and unheeded. It is true that this particular document is indexed in the United Nations Documents Index under the heading of human environment, but it takes an experienced researcher and considerable time to unearth it in this way, and then there is no indication of the breadth of thought covered. Only if reference librarians are thoroughly familiar with these materials, or if they can be found through an annotated bibliography, can one be sure of covering most of the documents in such a subject.

Unfortunately, at the urging of the economy-minded United States, the preparatory committee decreed that no records of the Stockholm Conference would be issued, only an action plan for submission to the U.N. General Assembly. As a result, all the discussions in the committees (frequently revealing original ideas), the concise briefings, and the informative addresses at the NGO meetings are lost. Speeches in the plenary were frequently repro-

duced by the sponsoring organizations or countries, but one would have to have a list and try to track them down to get any kind of coverage, since the coverage in the press was often sketchy and inaccurate.

The final report of the conference is not yet even generally available, although it will be eventually issued as a U.N. document. Conference coverage must be supplemented by other elusive papers. One is the daily news tabloid *The Stockholm Eco*,<sup>21</sup> produced by the *Ecologist* and Friends of the Earth during the conference. It was eagerly followed and enormously useful to Stockholm participants as the only reliable daily information sheet; the file of thirteen issues still makes enthralling reading. An eloquent summary of the results of the conference and some of the addresses is in another tabloid, *Environment, Stockholm*,<sup>22</sup> produced by the U.N. Centre for Economic and Social Information, Geneva. Until the establishment of the secretariat this centre is responsible for all U.N. environmental information.

These, then, are only some of the highlights of the work being done in international documentation on environmental problems. It is up to us to acquire these documents, to follow the work of the organizations, to make their works known to our various publics. Only then can we fulfill the promise of Stockholm and through our work and our knowledge as individuals, in our libraries, and in our professional organizations help to create not only a better world but to insure the survival of this, the only one we know.

The rest of the drama which opened at Stockholm will be played out in the fall 1972 session of the U.N. General Assembly at New York. In implementing the Stockholm resolutions, the United Nations cannot order member nations to comply; it can only recommend. In the long run nothing effective will be done at the national level anywhere without public demand. Governments, whatever their nature and commitments, do respond to public pressures. A constituency of the environment is required all over the world, and the first thing needed to bring this about are strong, persistent, factually sound programs of public information.

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Much of the credit for this paper goes to my colleagues Signe Ottersen and Marion Parks.

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## A Guide to Environmental Information Services of the Private Sector

In Cincinnati in September 1972, at the Environmental Protection Agency's Information Symposium, several thousand participants heard several dozen speakers spend the better part of two days discussing sources of environmental information. I learned at that conference that there is little need to detail the number of sources that exist, and a great need to clarify *how* those sources can be discovered, evaluated and best used.

I will limit my discussion to environmental information services offered by the private sector, and emphasize how others can be found and best used.

The discussion will include:

1. The importance of objective setting: defining the kind of information that is needed (and not needed).
2. A candid description of secondary publications such as directories, and environmental abstracting and current awareness services.
3. Use of automated searches and machine-readable data bases.
4. Four appendices are included which cover: environmental directories; environment abstracting and indexing services; information centers and systems—services offered; and environmental journals (compiled by Mike Bowen of *Environmental Science and Technology*).

### THE IMPORTANCE OF OBJECTIVE SETTING: DEFINING THE INFORMATION NEEDED

Much has been written about the information explosion, but a clearer idea comes to mind through these figures from the Information Industry Association: 1971 saw publication of 450,000 book titles, 200,000 periodicals, 200,000 technical reports, 40,000 doctoral dissertations, 100,000 master's theses, 65,000 patents, 20,000 congressional bills, and 150,000 federal court cases.

Before tackling this largesse, it helps to know what one needs and does not need. For instance, a search to compare performance data on electrostatic precipitators would not be fruitful through the *Readers' Guide*, nor would it entail extensive historical searching, since new standards have made older equipment obsolete. In fact, some organization may exist that has already done such collating.

Often overlooked are such crucial questions as:

1. Is the need answer-oriented, or documentation-oriented?
2. Is the problem strictly current, or can older information apply?
3. Should all the world's literature be searched, or just a few specific books or journals?
4. Should nonperiodical information be included?
5. Is the need discipline-oriented? profession-oriented? multi-disciplinary or mission-oriented, such as environment?
6. How fast is all this data needed?

## USE OF SECONDARY SOURCES: WHAT ORGANIZATIONS OR LITERATURE FILL THE NEED?

The pursuit of information falls into two synergistic categories: (1) ask someone who is apt to be familiar with the problem, or (2) locate existing documentation. In secondary source jargon, this means: (1) directories, and (2) indexing and abstracting services.

### Directories

Little can be said of environmental directories except that a comprehensive and user-oriented one has yet to be created. The probability of a productive "hit" is low with existing references because comprehensiveness is made virtually impossible by the flux of the environmental sciences (the 1972 *Environment Index* had a 50 percent change factor in state environmental control directors), and because most directories are inadequately organized and indexed. In many cases, one has to know the name of an organization in order to find it in the directory. A host of environmental directories abounds, but only a few have proven valuable in environmental research. These are detailed in appendix A, but I will discuss each briefly.

*Directory of Organizations Concerned with Environmental Research.* Until the new edition is received, opinions must be based on the first edition, which was a computer printout of names and addresses of institutions. These were categorized by state, with no descriptive materials, and a numeric, inadequate indexing system.

*Environmental Pollution: A Guide to Current Research.* This analysis of the Smithsonian Institution's Science Information Exchange files categorizes

research according to major headings, with useful subject indexes. Unfortunately, while 1,000 pages are devoted to contents, only two pages describe how the contents are organized. In order to find out, one must plow through most of the 1,000 pages.

*Directory of Consumer Protection and Environmental Agencies.* We have not yet received this volume, but conversations with users indicate satisfaction.

*Directory of Environmental Information Sources.* This is the best horizontal listing currently available only because nothing else like it exists. The expanded, hardbound second edition provides a cursory listing of books and films, but does contain much useful and descriptive matter on organizations involved directly and indirectly in environmental information. Unfortunately, the typewriter type is hard on the eyes, and indexing is not subject-oriented.

*Conservation Directory.* This valuable, generally accurate and very inexpensive directory lists and describes international, national and state conservation groups and government organizations. It includes individual names and publications index, but lacks a subject index.

*Yell-O Pages.* This 1971 computer printout of local citizens environmental groups is probably quite outdated, due to the ad hoc nature of such groups.

*Encyclopedia of Information Systems.* This most valuable guide to centers, systems and services provides detailed profiles on some 800 organizations.

*Water Publications of State Agencies.* This is a comprehensive valuable access point to local programs and publications that would be nearly impossible to otherwise locate.

*Pollution Control Directory.* The *Environmental Science and Technology* and the journals of the Air Pollution Control Association and the Water Pollution Control Federation also have annual directory issues that provide useful information (see appendix D).

## Abstracting and Indexing Services

The best guide to the hundreds of abstracting services is *Ulrich's International Periodicals Directory* which lists forty pages of such services.

Since successful use of an abstracting service varies directly with the nature of one's information needs, it is essential that two primary questions be answered before selection proceeds:

1. How should information be conceptualized? Can the information sought be found through strictly disciplinary channels such as chemistry? (If so, then consult *Chemical Abstracts*.) Does it parallel a traditional profession such as engineering? (Then consult *Engineering Index*.) Does it

pertain to a specific kind of document, such as dissertations? (Then consult *Dissertation Abstracts*.) Or does it, as is the case with much of environmental reference work, transcend traditional information boundaries, document types, disciplines and professions? In that case the new environmental abstracting services, such as *Environment Information ACCESS* should be consulted.

2. What is the scope and depth of one's need? What scope of coverage is required, 300 or 3,500 journals? Journal literature only, or a mixed literature base? How detailed should subject coverage be? Does it stop with air pollution, or include such specifics as dust baghouses and stack configurations? How timely is the nature of the needed information: historical, or strictly current awareness? Will document retrieval be required? This may be an important timesaver, unless one is prepared to track down that article from *Pacific Insect*.

Would automatic search assistance be valuable? Comparing these needs to the services offered by potential abstract candidates is more complex, since *Ulrich's* does not provide details (check the *Encyclopedia of Information Systems*), but hopefully this discussion will provide some insights.

John Veyette's article discusses such institutional abstracting services as *Chemical Abstracts*, *Biological Abstracts* and *Engineering Index*; I will describe the leading private environmental literature reference services.

#### ENVIRONMENT INFORMATION ACCESS

This service of the Environment Information Center is issued semimonthly and reports new literature on twenty-one major areas of environmental affairs, including energy, environmental design, population control, food and drugs, transportation, weather modification, and wildlife, as well as the common categories of air, land, noise, wastes and water. *ACCESS* covers a mix of literature, including 3,500 international journals, government documents, conference papers and proceedings, research reports, special publications, and major newspaper articles. Special selections also cover books, *Federal Register* environmental entries, legislation, patents, and research in progress. Emphasis is on currency of information. All abstracts are staff written to emphasize the environmental significance of a document. Each issue includes an index section, through which abstracts can be located according to subject, industry (Standard Industrial Classifications) and author. All indexing is multiple entry, providing title, source, date, volume and number, page number, length in full page equivalents, and an accession number.

Example: Effluent Taxes: Abatement Prods or  
Budget Balancers? Indust Water Engrg,  
Apr 71, v8, n4, p18 (1) 07-71-03147

All indexing is cumulated annually in *The Environment Index*, which



### CURRENT CONTENTS

This weekly service is not strictly environmental but merits coverage since three environmentally significant components are offered: (1) agricultural, food and veterinary sciences; (2) engineering and technology; and (3) life sciences. Contents pages of journals (coverage averages 800 journals per service) are reproduced, as in *Environmental Periodicals*—again not in alphabetic sequence. Contents are not indexed; but other Institute for Scientific Information services permit index analysis of its data base. Document retrieval is offered; no microfiche; searches and selective dissemination of information profile monitoring is available, but costs are not standardized. For a specific breakdown of the cost, journal coverage, lag time and services offered, consult appendix B.

### AUTOMATED SEARCHES AND MACHINE-READABLE DATA BASES: IS THE PRICE WORTH THE RESULT?

The rapidly increasing size of most literature files (*Chemical Abstracts* is estimated at 500,000, ISI at 400,000) virtually demands machine-processing of bibliographic information. Particularly when a researcher is confronted with a massive retrospective file, machine searching can at least separate wheat from chaff.

Rather than provide an exhaustive listing of the various services available, I direct the reader to the *Encyclopedia of Information Systems*, which describes 800 information services and indicates which ones provide searches and rent machine-readable data bases.

This discussion will be restricted to a few private services with environmental specialization, and to some comments about such services in general.

#### Data Base Producers Who Also Provide Searches

Only two private organizations provide such services: EIC and ISI.

EIC search requests can be made directly to headquarters, based upon a general descriptive request, which is translated into keywords. A request may search just one keyword or combination of keywords. Price base for any search is \$75, plus \$10 per keyword. Output at present is a bibliographic citation and accession number which can be used to retrieve the abstract and full transcript of a particular document. Searches include both current and retrospective information.

ISI offers a variety of search techniques, including retrieval of documents according to the kinds of references they cite, according to interest profiles (selective dissemination of information) and keywords. Prices are not standardized and are best obtained from ISI.

### Service Bureaus

Many data base producers prefer to distribute their information wholesale to service bureaus such as New England Research Applications or Lockheed Information Systems, which will perform searches or install on-line terminals in a subscriber's facilities. Price and type of output vary with the organization, but NERAC is a good example. This independent branch of the University of Connecticut acts as a computer-based information processing house for such data bases as *CA Condensates*, *Compendex*, BIOSIS, NTIS, DDC, ISI and others. Search prices are based on a flat rate of \$185 for 500 hits per data base, plus \$25 per additional hit and 20¢ per additional abstract retrieval. Output is a citation printout and searches are supervised by professionals.

### Interactive Systems

The best example of the rapidly increasing interactive networks is *Leadermart*, centered at Lehigh University, which shares a variety of data bases with the University of Georgia, University of Pittsburgh and others. Data bases can be searched through an on-line conversational mode system, using cathode ray tube terminals. Price depends on the amount of computer time used; output is on the CRT, but can be retrieved in hard copy from an on-line printer.

A commercial counterpart to *Leadermart* is the Lockheed Information Systems network mentioned earlier, but access is only through one's own installed terminal. Cost varies between \$200 and \$800 per month, depending on usage.

### Rental of Machine-Readable Data Bases

If indigenous computer equipment is available, data bases can be organizationally acquired and searched. *Environmental Science Index* is a computer tape service which can be rented in one master reel (\$3,825) or six environmental subcategories (\$975 each) which cover land environment, air environment, water, wastes, health and energy. The service includes monthly update tapes.

ISI's data base can be rented in its entirety (\$20,000) or by components such as *Science Citation Index* (price varies with subscriber type).

### Use of Automation

The major question facing users of automated access systems is one of compatibility with search needs and objectives. The same questions that applied to abstract services should apply here: Is it a discipline-oriented need? Is it multi-disciplinary, e.g., found in the environmental sciences? Two EIC experiences illustrate this need: case no. 1 involved a custom-requested search through the mails of a scientific literature data base on "the environmental

impact of water resources development" (including twenty-five specific keyword indicators, from erosion to reservoirs). Although resulting printouts retrieved several hundred bibliographic citations, only two could be considered relevant "hits."

Case no. 2 involved a search using an on-line conversational mode interactive search system, using *Chemical Abstracts*, *Compendex*, *ASCE Abstracts* and some other data bases. The search involved "environmental effects of nitrogen supersaturation from dams"—a phenomenon that is killing salmon in the Pacific Northwest.

Two major reasons caused these nonproductive searches: (1) retrieval methodology, and (2) data base specialization. In Case no. 1, the retrieval scheme was probably at fault, since indexing was computer-derived from titles. If the title did not contain a certain keyword, it could obviously not be indexed, nor could the system make value judgments about the connotations of a title. These limitations become particularly significant in the environmental sciences which incorporate a large body of literature not structured according to standard scientific methods.

Case no. 2 involved data bases whose indexing was based on original documents, not just title, but in the process of system incorporation a unique retrieval method (descriptive phraseology) was superimposed which did not permit Boolean search capability. The discipline-oriented data bases also probably did not fit the search, which required a more environmental data base.

Such experiences led to the development of the recently announced *Environmental Science Index*. This computer-tape service crosses disciplinary lines, is based on a manually indexed, controlled vocabulary, and based on original document readings, using an EIC-developed environmental thesaurus.

It would, however, be just as futile to search *Environmental Science Index* for general chemical literature as it is to search *Chemical Abstracts* for environmental effects of nitrogen from dams.

The answer to the question: "Are automated systems worth the cost?" is that the intelligent coupling of high-speed machine search capability with human supervision *can* provide cost-effective quality searching of otherwise unmanageable data bases. Hours of tedious, manual searching can be avoided, leaving more time for analysis of a handful of relatively productive documents.

Although the details of this paper have been limited to private environmental services, these guidelines should apply to services that are not strictly environmental.

The best way to negotiate the environmental information maze is through secondary services or systems. The following appendices provide a starting point.

# APPENDIX A

## ENVIRONMENTAL DIRECTORIES

<i>Subject Coverage</i>	<i>Title</i>	<i>Author</i>	<i>Publisher</i>	<i>Date</i>	<i>Cost</i>	<i>Pages</i>
Environmental research organization	<i>Directory of Organizations Concerned with Environmental Research</i>	Lake Erie Environmental Studies	Holt Information Systems, 383 Madison Ave., N.Y., N.Y. 10017	1972		
Environmental research in progress	<i>Environmental Pollution: A Guide to Current Research</i>	Smithsonian Science Information Exchange	CCM Information Corp., 866 Third Ave., N.Y., N.Y. 10022	1971	\$39.95	851
Federal government	<i>Directory of Consumer Protection and Environmental Agencies</i>	California Center for Public Affairs	Academic Media 32 Lincoln Ave., Orange, N.J. 07050	1971	\$39.50	
Environment information resources	<i>Directory of Environmental Information Sources</i>	Nat'l Foundation for Environmental Control	Nat'l Found. for Environ. Control 151 Tremont St. Boston, Mass. 02111	1972	\$29.95	457
Conservation and environmental groups	<i>Conservation Directory</i>	Nat'l Wildlife Federation	Nat'l Wildlife Fed., 1412 16th St. NW, Wash. D.C. 20036	1972 annual	\$ 2.00	165
Local environmental groups	<i>Yell-O Pages</i>	Environmental Resources	Environ. Resources 2000 P. St. NW Wash. D.C. 20036	1971	\$5-15	240
Information systems	<i>Encyclopedia of Information Systems</i>	Anthony Kruzas	Academic Media 32 Lincoln Ave. Orange, N.J. 07050	1971	\$67.50	
Water information	<i>Water Publications of State Agencies</i>	Water Information Center, NY	Water Research Bldg., Manhasset Isle, Port Washington, N.Y. 11050	1972	\$39.50	319
Industrial products and services	<i>Pollution Control Directory</i>	Environmental Science and Technology	Amer. Chemical Soc. 1155 16th St. NW Wash. D.C. 20036	Oct. 1972	\$ 9/yr	162

# APPENDIX B

## ENVIRONMENTAL ABSTRACTING AND INDEXING SERVICES

	Index	Issues Abstracts	Subj. Cov.	Cum. Index	Periodical Cov.	Non-Periodical
<i>Environment Information ACCESS</i>						
EIC, 124 East 39th St. NY, NY 10016	X	X	21 +	X	3500	X
<i>Pollution Abstracts</i>						
PO Box 2369 La Jolla, CA 92037	X	X	7	X	3500	X
<i>Environmental Periodicals</i>						
Env. Studies Inst., Int'l Academy Riviera Campus, 2048 Alameda Padre Serra, Santa Barbara, CA 93103			no breakdown		300	
<i>Current Contents - Agricultural, Food and Veterinary Sciences</i>					800	
<i>Engineering and Technology</i>					700	
<i>Life Sciences</i>			no breakdown		1000	
Inst. for Scientific Information 325 Chestnut St. Philadelphia, PA 19106						
<i>Environment Information ACCESS</i>						
<i>Pollution Abstracts</i>						
<i>Environmental Periodicals</i>						
<i>Current Contents</i>						
	Audio Visual	Coverage Lag	Frequency	Searches	Document Retrieval	Type of Index
	X	1 to 3 months	22X	X	X	multiple entry
		6 to 8 months	6X	X		keytalla
		contents pages only 2 to 6 months	8X	X		N/A
		contents pages only 1 to 2 months	52X	SDI only	X	

# APPENDIX C

## INFORMATION CENTERS AND SYSTEMS—SERVICES OFFERED

	Collect	Index	Abstract	Analysis	Docu. Retrieval	SDI	Retrospec. Search	Spec. Con. Projects
EIC (Environment Information Center) 124 East 39th St. New York, NY 10016 (environment)	X	X	X	X	X	X	X	X
Institute for Scientific Information 325 Chestnut St. Philadelphia, PA 19106 (scientific)	X	X			X	X	X	
Congressional Information Service Montgomery Building Wash. D.C. 20014 (congressional)	X	X	X		X			
Bureau of National Affairs 1231 25th St. NW Wash. D.C. 20037 (legal)	X			X	X			X
Aspen Systems Corp. 4615 Forbes Ave. Pittsburgh, PA 15213 (legal)	X	X			X			
Lockheed Information Sciences 405 Lexington Ave. New York, NY 10017 (scientific)						X	X	
Pandex—Current Index of Scientific and Technical Literature CCM Info. Corp. 909 Third Avenue, NY, NY 10022 (scientific)								

#### APPENDIX D ENVIRONMENTAL JOURNALS

This appendix is not claimed to be totally comprehensive. It should be considered only as a guide to technical literature and as indicative of different types of publications.

Explanations of the column headings are given below:

- Cost: Annual subscription in U.S. Those affiliated with issuing society or association generally get a discount. Foreign subscriptions cost more; institutional subscriptions usually cost more than individual. C.C. means "controlled circulation"—free subscription to "qualified readers." Those not qualified must pay.
- Aimed at: The primary audience for whom publication is edited. Publications sometimes use jargon and special terms which only their primary audience can understand.
- Technical Level: Low: can probably be read by educated laymen.  
Moderate: technical training may be necessary to understand some or all articles.  
High: specialized technical training essential to understand articles.
- Availability: Indication of whether available on newsstands, in public libraries, technical libraries, or so specialized as to be available only in some technical libraries.

APPENDIX D (cont.)  
SCIENTIFIC JOURNALS

<i>Title</i>	<i>Publisher (year of appearance)</i>	<i>Frequency</i>	<i>Cost</i>	<i>Aimed at</i>	<i>Technical Level</i>	<i>Availability</i>
<i>Environmental Science and Technology</i>	American Chemical Soc. (1967)	monthly w/annual directory	\$ 9.00	env. profs.	low-high	technical libraries, some public libraries
<i>Environmental Pollution</i>	Elsevier (1970)	quarterly	15.60	env. res.	high	technical libraries
<i>Water Research</i>	Pergamon Press (1967)	monthly	100.00	water sci.	high	technical libraries
<i>Water Resources Research</i>	Am. Geophys. Union (1965)	bimonthly	20.00	water supply profs.	high	technical libraries
<i>Bulletin of Environmental Contamination and Toxicology</i>	Springer- Verlag (1966)	bimonthly	28.00	prof. toxicals.	high	technical libraries
<i>Atmospheric Environment</i>	Pergamon Press (1967)	monthly	60.00	air pol. profs.	high	technical libraries
<i>Environmental Letters</i>	Marcel Dekker (1971)	8/yr.	40.00	env. res.	high	technical libraries
<i>Journal of Environmental Sciences</i>	Institute of Env. Sciences (1958)	bimonthly	12.00	env. res.	high	technical libraries

## NON-SCIENTIFIC JOURNALS

<i>Title</i>	<i>Publisher (year of appearance)</i>	<i>Frequency</i>	<i>Cost</i>	<i>Aimed at</i>	<i>Technical Level</i>	<i>Availability</i>
<i>Environmental Affairs</i>	Boston Coll. Env. Law Center (1971)	quarterly	\$ 15.00	inter- disci- plinary audience of profs.	low-moderate	?

APPENDIX D (cont.)  
TRADE PRESS

<i>Title</i>	<i>Publisher (year of appearance)</i>	<i>Frequency</i>	<i>Cost</i>	<i>Aimed at</i>	<i>Technical Level</i>	<i>Availability</i>
<i>Industrial Wastes</i>						
<i>Water and Sewage Works</i>						
	Scranton Publ. Co. (1890)	monthly	\$ 7.50	munic. water & waste engrs. & off.	low-moderate	some technical libraries
<i>Effluent and Water Treatment Journal (British)</i>	Thunder- bird Enterprises (1961)	monthly	\$15.00	munic. water & waste engrs. & off.	low-moderate	some technical libraries
<i>Water and Wastes Engineering</i>	Dun-Donnelley (1964)	monthly	C.C./ \$ 6.00	water supply profs.	low	some technical libraries
<i>Industrial Water Engineering</i>	Target Communic. (1963)	bimonthly	C.C./ \$10.00	water supply profs.	low-moderate	some technical libraries
<i>Pollution Engineering</i>	Technical Publ. (1969)	monthly	C.C./ \$12.00	ind. engrs. manage- ment	moderate	technical libraries
<i>Waste Age</i>	3 Sons Publ. Co. (1970)	bimonthly	C.C./ \$10.00	solid waste profs.	low	?
<i>Environmental Pollution Management (British)</i>	The Nat'l. Mag. Co. (1971)	monthly	C.C. only	ind. manage- ment	low	?
<i>The American City</i>	Buttenheim Publ. Co. (1909)	monthly	C.C./ \$15.00	munic. off.	low	technical libraries many public
<i>Solid Waste Management</i>	RRJ Publ. Co. (1958)	monthly	\$ 6.00	solid waste profs.	low	technical libraries

APPENDIX D (cont.)  
GENERAL MAGAZINES

<i>Title</i>	<i>Publisher (year of appearance)</i>	<i>Frequency</i>	<i>Cost</i>	<i>Aimed at</i>	<i>Technical Level</i>	<i>Availability</i>
<i>Ecology Today</i>	Ecological Dimensions (1970)	bimonthly	\$ 6.00	concerned laymen	low	mail sub. some public libraries
<i>The Ecologist (British)</i>	The Ecologist Ltd. (1970)	monthly	\$12.00	concerned laymen	low	mail sub.
<i>Clean Air (British)</i>	Nat. Soc. For Clean Air (1929)	quarterly	\$ 3.50	concerned laymen & profs.	low	some libraries
<i>Environmental Quality Magazine</i>	Env. Awareness Assoc. (1970)	monthly	\$10.00	concerned environ- mentalists, "ecofreaks"	low	newsstands (\$1)
<i>Environment</i>	Comm. For Env. Inf. (1958)	10 issues/ yr.	\$10.00	intelligent laymen	low-moderate	technical libraries many public libraries

APPENDIX D (cont.)  
TECHNICAL JOURNALS

<i>Title</i>	<i>Publisher (year of appearance)</i>	<i>Frequency</i>	<i>Cost</i>	<i>Aimed at</i>	<i>Technical Level</i>	<i>Availability</i>
<i>Journal Water Pollution Control Federation</i>	Water Pol. Control Federation (1928)	monthly with 2 extra issues	\$35.00	water pol. profs.	moderate-high	technical libraries
<i>Journal of the Air Pollution Control Assoc.</i>	Air Pol. Control Assn. (1951)	monthly	\$25.00 to non- profit libraries & indivs.	water supply profs.	moderate-high	technical libraries
<i>Journal of American Water Works Assn.</i>	Amer. Water Works Assn. (1914)	monthly	\$20.00	water supply profs.	moderate	technical libraries
<i>Journal of the Sanitary Engineering Division (ASCE)</i>	Amer. Society of Civil Engineers				moderate-high	technical libraries
<i>Journal of Environmental Health</i>	Nat. Env. Health Assn. (1938)	bimonthly	\$ 8.00	public health profs.	low-moderate	technical libraries

JOHN H. VEYETTE, JR.  
Manager, Planning Office  
*Engineering Index*  
New York, New York

## National Information Centers, Facilities and Services for the Environmental Sciences

It is with some apprehension that I attempt to write a paper on this subject, mainly because the tremendous breadth of the subject defies adequate coverage. In addition, I am sure that even now another "information service" oriented to the needs of "environmentalists"—scientists, engineers, researchers, teachers, students, or concerned citizens—is being announced and promoted. I will use the term "environmentalist" to cover the range of people involved in the theme of this Institute.

To adequately cover this topic would have necessitated many months of extensive research and study. I will only cover the major or principal activities, and will limit myself to national, governmental and "not-for-profit" activities. Even with this limitation, it is a little like finding one end of a skein of yarn and not knowing where it goes or where it may end. Fortunately, others have done considerable work in the area and I will refer to them.

### ENGINEERING INDEX

#### Background

Let me first cover my own organization, Engineering Index, Inc., because it is the one with which I am most familiar. EI is strictly engineering oriented, but is transdisciplinary in its coverage. If one is interested in the engineering aspects of the environment and the application of engineering methodology to its improvement and control, then EI is probably the best place to look—certainly the first place. EI does not cover federal, state or municipal statutes or laws, with the exception of boiler codes. It does not scan the *Wall Street*

*Journal*, the *New York Times*, *Newsweek*, *Forbes*, *Fortune*, etc., nor does it cover proposed legislation introduced into U.S. or state congressional bodies. In short, EI is not a "newsletter" type of service; it is a most useful index to the world's primary sources of the technical engineering aspects of the environmental sciences.

EI has been in business since 1884 serving the informational needs of the engineering community. Daily, throughout the world, technical information is produced and published in vast quantities, from knowledge and experience generated by individual engineers, scientists, governmental agencies and universities, as well as industry. This information includes the methods, results, tabulations, conclusions, and applications of research, reported in many ways: e.g., a paper may be read at a conference, an article may be published by a professional society, or a book may be written. The sources are so numerous that it is virtually impossible for anyone, whether he is making a simple inquiry or doing extensive research, to be informed fully on any given subject.

How, then, does an environmentalist today remain informed of available technical information of last month, last year, or the last decade? How can he search for a specific piece or area of information pertaining to a particular problem without consulting every paper, book, journal, or conference proceeding around the world? Obviously, he cannot perform such a task by himself. But EI and other indexing and abstracting organizations providing similar services make his search possible by providing him with tools for his task.

EI's staff of technical editors, who are also engineers or scientists, read and analyze thousands of articles each year and systematically abstract and index them in order to make them accessible to EI product users. In his search, the user need only scan EI's specialized index to find entries pertinent to his specific concern. Then he may choose selectively those entries which will be most valuable to study in detail. EI enables the environmentalist to find the information he needs; it saves him both time and money and simplifies his task because he need consult only one comprehensive source.

EI is also unique in that it is transdisciplinary. This means that EI alone brings together, in one place and in English, information from all disciplines of engineering from original English and foreign language sources. This is extremely important today when an inquiry is one discipline quite probably entails necessary research from other relevant disciplines as the sophistication of technology constantly accelerates.

While the present deep concern for our environment is relatively new and some information services have capitalized on this growing concern, EI has been covering the subjects since its inception. In the 1947 issue of EI entries may be found under air pollution, noise elimination and water pol-

lution. In the 1922 edition, there are entries under air pollution, water pollution, water supply—contamination, and airplane engines—silencers. Even in volume one, covering the 1884-1891 period, there are entries under air, river pollution, and water contamination and pollution. EI notes that in 1884 a city engineer in Providence, R.I. was concerned with the "properties and disposal of manufacturing wastes."

EI's mission then, is the easy transfer of information from the original source to the ultimate user by providing a data base of abstracts or other entries in several different and useful product forms and services. EI is accomplishing this mission by bringing together information products and services in a unified system. Since the informational needs of engineers are constantly changing, product development is going on continuously. Basically, this is being done by creating a data base encompassing an expanding coverage of the literature within EI's scope. Also, by multiple use, this data base is fully and efficiently exploited to generate a broad spectrum of information services and products.

### Issuance of the Data Base

The data base is presented in three different forms for the user's convenience. These include the printed form, machine-readable form and microform.

#### PRINTED FORM

*The Annual.* Since 1884, the *Engineering Index Annual* has been a unique, cumulative record of the preceding year's worldwide engineering literature. It has long been the standard reference for retrospective search of the technological literature housed in the libraries of many nations. The 1971 four-volume set, with more than 5,400 pages, contains 85,000 abstracts and items arranged under 12,000 main subject headings and subheadings, liberally cross-referenced, and has an author index of 137,800 authors. Each *Annual* contains all the abstracts and items published in the twelve monthly issues of the preceding year in the *Engineering Index Monthly*.

*The Monthly.* Since its introduction in 1962, the *Engineering Index Monthly* has been the only printed English monthly service covering the worldwide engineering spectrum. 1972 issues average more than 7,000 abstracts and items, annually covering some 3,500 publications—journals, transactions, proceedings of conferences and symposia, etc. Quick access to the abstracts and notations of content is provided by main headings and subheadings which are cross-referenced to enable the user to locate rapidly the abstracts or titles pertinent to his search. A computer-generated author index gives reference to page and abstract numbers of articles by persons known to the user.

*CARD-A-LERT.* Each week, *CARD-A-LERT* provides the user with a

preselected group or groups of 3 by 5 index cards that contain specialized, up-to-date abstracts pertinent to his particular area of interest. *CARD-A-LERT*, and its predecessor, the Engineering Index Card Service, have provided engineers with selective dissemination of information and current awareness since 1928—long before these terms or concepts came into popular usage. *CARD-A-LERT* is available in a wide selection of 6 disciplines, 38 groups, and 171 divisions of engineering information.

There are four primary divisions in EI's *CARD-A-LERT* system which are directly germane to environmentalists. These, with their approximate card production in 1971 are shown in table 1.

In addition there are thirteen other divisions which might contain information of interest to environmentalists. These, with their approximate card production in 1971, are shown in table 2.

The two groups shown in tables 1 and 2 total 9,995 items, approximately 12 percent of the total data base of 85,000. One-third are directly pertinent to environmental studies. In the case of the other two-thirds, some percentage would be relevant and only an exhaustive study by environmentalists involved in every aspect of the disciplines concerned would be able to ascertain the actual relevance factor.

To date EI has not issued a subset of its data base to serve the unique information needs of the environmental information seeker, except in the *CARD-A-LERT* format. We are currently considering the possibility and potential marketability of such a subset. In this regard it must also be said that EI has not issued any other subset of its data base. Our recent conversion to a computerized, photocomposition production system provides us with the capability to do this much more easily than was possible previously.

#### MACHINE-READABLE FORM

*Compendex.* Computerized *Engineering Index* makes available, in machine-readable monthly computer tapes, the entire EI data base beginning with January 1969. These tapes are designed for rapid current awareness with automatic retrieval by computer scanning of all abstracts and items contained on the tapes. The computer can retrieve pertinent abstracts, items, or bibliographic references from current or back numbers (retrospective search) of the *Compendex* tapes in response to the specific information needs of users. Various information centers around the world provide search services for the machine-readable data base in close cooperation with EI, some of which are listed in appendix A.

#### MICROFORM

*Microfilm Edition.* The entire file of EI is available on microfilm. This file, with its annual additions, provides in a compact, easily accessible form, a

<i>Division No.</i>	<i>Title</i>	<i>Approx. No. of Cards, 1971</i>
451	Air Pollution	900
452	Sewage and Industrial Wastes Treatment	625
453	Water Pollution	600
741	Acoustics, Noise, Sound	1600

**Table 1. Divisions of EI's *CARD-A-LERT* System of Special Interest to Environmentalists**

<i>Division No.</i>	<i>Title</i>	<i>Approx. No. of Cards, 1971</i>
403	Urban and Regional Planning	235
442	Flood Control, Land Reclamation	200
444	Water Resources	530
445	Water Treatment, General and Industrial	580
446	Waterworks	200
522	Gas Fuels	550
523	Liquid Fuels	250
524	Solid Fuels	400
611	Hydro & Tidal Power Plants	225
642	Industrial Furnaces and Process Heating	350
753	Sound Technology & Ultrasonics	400
912	Industrial Engineering & Management	1150
914	Safety Engineering	1200

**Table 2. Other Divisions of EI's *CARD-A-LERT* System**

complete, cumulative record of the world's pertinent engineering literature dating from 1884. At the end of 1971, this file comprised nearly 1,700,000 items, more than 99 percent of which include abstracts. A comprehensive ten-year cumulative subject heading/page designation oriented index is available, in both micro and bound-volume formats. Covering the years 1961 through 1970, it is a most valuable retrospective search tool for both the micro-edition and the bound volumes of the *Engineering Index Annual*.

### Concurrent Bibliographic Services

*Publications Indexed for Engineering (PIE)*. This lists the journals and certain other serial publications abstracted and indexed selectively for each calendar year; it is published in the *Engineering Index Annual* of that year and as a separate publication. In addition to the alphabetical listing of each publication, the following are also included: CODEN; American National Standard Insti-

tute abbreviation; and the type of editorial review given to it—complete, partial, or monitored coverage.

*Subject Headings for Engineering (SHE)*. This is the published authority list of over 12,000 main headings and subheadings used for in-depth alphabetical subject indexing of EI's data base. This authority list or controlled vocabulary is available as a reference, indexing and classification tool and is published to aid in the development of literature search profiles, to identify the *CARD-A-LERT* division codes to which subjects are assigned, and to provide an overview of the subject structure of the EI information services. The list undergoes constant revision and is republished after each significant revision.<sup>1</sup>

## CHEMICAL ABSTRACTS SERVICE

The following information on CAS coverage of ecological and environmental matters is from a letter from Ralph E. O'Dette, senior staff advisor of CAS.

Of the eighty sections of *Chemical Abstracts*, three are wholly concerned with the science and technology of the environment or its pollution. These are: Section 59—Air Pollution and Industrial Hygiene, Section 60—Sewage and Waste, and Section 61—Water. In the first half of 1972 (*CA*, Vol. 76) these three sections carried a total of 3,700 abstracts of which almost 3,100 were journal articles, 500 patents, and the balance books. Coincidentally, the three sections were nearly equal in size.

In addition, seven other sections may contain abstracts of documents pertinent to environmental science and technology. These are: Section 4—Agrochemicals (pesticides and plant growth regulators), Section 5—Toxicology, Section 19—Fertilizers, Soils, and Plant Nutrition, Section 46—Surface-Active Agents and Detergents, Section 50—Propellants and Explosives, Section 51—Petroleum, Petroleum Derivatives, and Related Products, and Section 52—Coal and Coal Derivatives. Abstracts are placed in these sections on the basis of major subject emphasis, but there may be considerable peripheral interest to the environmentalist. Access to the citations of interest in these sections may be gained through cross-references found at the end of each section, the keyword subject index published with each issue of *CA*, search of the *CA* volume indexes, or search of appropriate machine-readable files.

Exact figures on the number of abstracts of interest to environmental science and technology in these sections are not available, but it is felt that there are at least 5,000-7,000 such citations annually.<sup>2</sup>

The following is extracted from a *CAS* brochure entitled "Information System."<sup>3</sup> I include these comments because they reflect the present trend in the information industry towards satisfying information needs by combining

several separate services or products to create a data base of greatly expanded coverage, with resultant increased customer satisfaction with the services provided. While I am not projecting the demise of the 3 by 5 catalog card with the hole in the bottom, we must recognize that it is no longer the sole tool available to the information seeker.

The Chemical Abstract Service Information System is a group of related chemical information services that provides a user with the opportunity to devise an information retrieval program that best suits his particular information needs, work situations and facilities.

The components of the system are:

*Chemical Abstracts*

*CA Sections Groupings*

*CA Condensates*

*CA Integrated Subject File*

*Chemical-Biological Activities*

*Polymer Science and technology*

*Chemical Abstracts on Microfilm*

*Chemical Titles*

*Patent Concordance and Special Indexes to Chemical Abstracts*

*Chemical Abstracts Service Source Index and Quarterly*

Properly employed, the CAS Information System is a powerful vehicle for information retrieval. While a single CAS service is often used most effectively as the data base from which chemical information services are derived, it is when several system components are employed concurrently that the full potential of the CAS Information System may be realized.<sup>3</sup>

## BIOSCIENCES INFORMATION SERVICE (BIOSIS)— ENVIRONMENTAL INFORMATION SERVICES

The following information was obtained at the recent National Environmental Information Symposium in Cincinnati, Ohio. It is included here as the best description available of BIOSIS's contribution to this topic.

BIOSIS (BioScience Information Service of *Biological Abstracts*) provides computerized retrieval services as well as printed information products in all fields of biology, biomedicine, and biochemistry. Especially relevant to the researcher in the environmental sciences are the following information services:

1. *Abstracts on Health Effects of Environmental Pollutants* is a monthly abstracts journal created by BIOSIS in response to the critical needs of scientists today for current information on environmental pollution. The new publication is comprised of selected material from BIOSIS and MEDLARS of the National Library of Medicine. Each issue contains bibliographic information on approximately 1,000 research articles and includes author, subject, and cross indexes in a format similar to that used in *Biological Abstracts*. The reference materials included in *Abstracts on Health Effects of Environmental Pollutants* cover the following:

Occupational health and industrial medicine.

Chemicals or substances in the environment with emphasis on their effects on human health.

General reviews and original papers reporting potentially harmful effects of pollutants on humans.

Studies of lower vertebrates used as indicators of the substances toxic to man; and vertebrates and invertebrates as vectors in the food chain.

Reports of analytical methods for examining biological tissues or fluids.

2. BIOSIS also has a series of very highly specialized abstracts publications, several of which relate to the environmental disciplines:

*Bioresearch Today—Environmental Pollution*

*Bioresearch Today—Human Ecology*

*Bioresearch Today—Food Additives and Residues*

*Bioresearch Today—Pesticides*

*Bioresearch Today—Industrial Health and Toxicology*

Each of the titles in this series contains between 100 and 200 abstracts per month.

3. *Retrospective Search Service*

Using a data base which includes about 1.8 million items from roughly 8,000 serial publications, BIOSIS can perform a comprehensive computerized literature search covering the last decade, 1960 through 1971. All through the search process, the unique nature of the particular information problem is kept in mind. A trained biologist oversees the search procedure to insure accurate and complete results.

4. *Current Literature Alerting Search Service—C.L.A.S.S.*

C.L.A.S.S. is a current-awareness service which regularly and automatically delivers a listing of articles, conference papers, books, and so on, which are specifically relevant to the individual scientist. Our computer stores his "profile," which is an outline of his special interest area, and matches this profile against the 36 yearly additions to the BIOSIS data bank. In this way, the researcher receives a personalized guide to the world's life sciences literature.

5. *Standard Profile Service*

The building of the machine-readable data base at BIOSIS provides the opportunity for the creation of an entire family of computerized services for the researcher. The latest of these, Standard Profiles, is designed in the same format as C.L.A.S.S., our Current Literature Alerting Search Service. The structure is the same. The service Standard Profiles differs from the individualized C.L.A.S.S. in that the profile used for the search is drawn to respond to a topic that would interest more than one scientist.

The advantages of subscribing to one or more Standard Profiles are two-fold: (a) an immediate service can be provided which avoids the sometimes complex and time-consuming process of designing a custom profile; and (b) the service can be offered at a lower price. The Standard Profiles currently available in the environmental sciences field are the following:

*Air Pollution*

*Biometeorology and Bioclimatology*

*Herbicides*

*Monitoring of Environmental Pollution*

*Pesticide Residues in Foods*

*Physiological Effects of Sound*

*Reclamation of Waste Materials*

*Sewage Disposal and Sanitary Measures*

*Pesticide Residues in Soil<sup>A</sup>*

Descriptive brochures for all of the above services may be obtained from BIOSIS. Figure 1 is a pollution-environmental biology subject profile, which shows the tremendous inter-relationships that exist in the subject area under consideration.

## NATIONAL TECHNICAL INFORMATION SERVICE (NTIS)

In its *Weekly Government Abstracts* service, NTIS issues an "Environmental Pollution and Control" publication. NTIS is a U.S. Department of Commerce activity. Publications cited are produced by U.S. government agencies and by leading private individuals and organizations on federal grants and contracts. Publications are announced from more than 225 federal sources including the EPA, Soil Conservation Service, Office of Saline Water, TVA, Federal Power Commission, Forest Service, National Industrial Pollution Control Council, U.S. Departments of the Navy, Agriculture, Housing and Urban Development, Army Corps of Engineers, Federal Highway Commission, Federal Aviation Service, General Services Administration, and many more.

NTIS also publishes and distributes most of the full texts of the material it abstracts and announces. Each item includes the price of the full-scale document and the microfiche edition, if available. Further information on this and other NTIS services may be obtained from NTIS, U.S. Department of Commerce, Springfield, Virginia 22151.

## AMERICAN PETROLEUM INSTITUTE (API)

API publishes *Abstracts of Air and Water Conservation Literature* weekly. Further information on this and other API services may be obtained from API, 1271 Avenue of the Americas, Room 795, New York, N.Y. 10020.

## ENVIRONMENTAL PROTECTION AGENCY

Sarah Thomas covered the activities of this agency in her paper for this Institute, so I will not discuss it. I will just mention one excellent brochure

# POLLUTION-ENVIRONMENTAL BIOLOGY

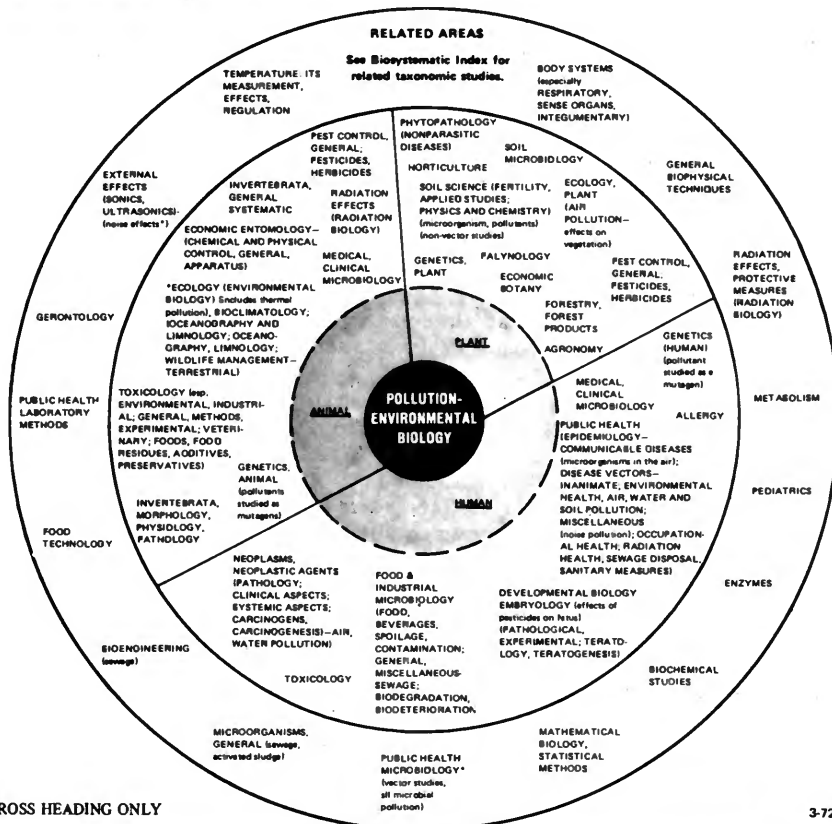


## SUBJECT PROFILE

SCOPE OF POLLUTION-ENVIRONMENTAL BIOLOGY RESEARCH IN  
BIOLOGICAL ABSTRACTS AND BIORESEARCH INDEX



• BIOSIS 1971 COVERAGE OF POLLUTION-ENVIRONMENTAL BIOLOGY INCLUDES 2,505 REPORTS SELECTED FROM SOME 7600 JOURNALS IN 100 COUNTRIES. • THIS SUBJECT PROFILE DEFINES THE SCOPE OF CURRENT PUBLISHED RESEARCH IN MAJOR AREAS OF POLLUTION-ENVIRONMENTAL BIOLOGY TO FACILITATE SEARCHES OF BIOLOGICAL ABSTRACTS AND BIORESEARCH INDEX IN THIS FIELD. IT SHOULD BE USED WITH THE GUIDE TO THE INDEXES AND THE SUBJECTS CLASSIFICATION OUTLINE, BOTH AVAILABLE UPON REQUEST FROM BIOSIS. • SEGMENTED DIVISIONS ARE ACCORDING TO BROAD FIELDS AND ALSO GENERAL GROUPINGS FOR THOSE HEADINGS IMPORTANT TO EACH SUBDIVISION. THE OUTER CIRCLE LISTS THOSE HEADINGS TO WHICH THESE REPORTS ARE FREQUENTLY CROSS-REFERENCED.



3-720-9

BIOSCIENCES INFORMATION SERVICE, 2100 ARCH ST., PHILA., PA. 19103, U.S.A.

Figure 1

published by the EPA in September 1972 entitled *Directory of Information Sources*. This twelve-page booklet lists fifty information sources, giving the subject matter each covers, its address, contact by name and phone number, and services provided. As a guide to EPA information sources it is a most valuable addition to a "source" collection.<sup>5</sup>

## ENVIRONMENTAL INFORMATION SYSTEM

The following description is from *Scientific Information Notes*.

The National Science Foundation and Oak Ridge National Laboratory are organizing a national environmental information network which could become the prime U.S. system for data on ecological and antipollution activities.

The Oak Ridge Environmental Information System Office is made up of several specialized information centers, or project support centers, and a variety of specialized data bases operating on local, national and international levels.

The centers are largely information-oriented, rather than document-oriented. Each is "imbedded" in an ongoing research activity, so that the staff includes and interacts with research scientists who presumably have special knowledge of recent research and can assist in evaluating the significance of recent findings.

Oak Ridge points out that the management of each center includes specialists who can answer inquiries from their own knowledge, and can decide how information might be transferred.

As part of this process, the centers can participate in and guide the preparation of state-of-the-art reviews, and can cooperate with other centers for a wider range of synthesis and analysis "thus allowing the system's total effect to be greater than the sum of the parts."

The EISO data base includes 216 federally or commercially sponsored information centers; 1,647 environmentally related research projects and project leaders located throughout the world, and names of Oak Ridge staff members involved in environmental research. The base is growing rapidly as new projects and programs are located.

a. The following ORNL centers are now part of the environmental information network:

1. *Ecological Sciences Information Center (ESIC)*—Designed to provide bibliographic reference data relevant to the movement, cycling and concentration of elements, isotopes, natural compounds and pollutants in different ecosystems. Contains over 3,000 selected references on terrestrial, freshwater and marine ecology.

2. *Environmental Mutagens Information Center (EMIC)*—Collects and disseminates information on genetic effects of drugs, food additives, cosmetics and industrial chemicals, with a data bank containing over 5,000 items.

3. *Eastern Deciduous Forest Biome Information Center*—This center was established in connection with the International Biological Program. Its major functions include computer storage, retrieval and analysis of

numerical data collected at the five sites within the biome—including meteorological, primary and secondary productivity, phenological and hydrological data—and bibliographic material concerning baseline ecological parameters. The center plans to publish an abstract journal for all IBP publications and data sets.

4. *Toxicology Information and Response Center*—Originally established as an arm of the National Library of Medicine. The initial emphasis will be on the capability to respond to questions on the toxicity of pesticides and other chemicals in the environment.

b. The following data bases are under development:

1. *Toxic Materials in the Environment*—References on arsenic, beryllium, cadmium, chromium, copper, fluorine, lead, manganese, mercury, molybdenum, nickel and zinc. Areas covered are natural occurrence, mining and extraction; uses and consumption; waste disposal, pollution sources and pollution; analytical methods and monitoring equipment; control, abatement and restoration; legal and political aspects; physiological and toxicological aspects; and biotransformation and ecosystem movement.

2. *Social Sciences Data Base*—Statistical data from the 1970 census on population and housing, as well as other sources on employment, business patterns and migration for state economic areas.

3. *Regional Modeling Data Base*—Includes approximately 2,000 abstracts on the development and use of mathematical models capable of simulating the economic, societal, ecological and land use responses of a geographical region to alternative policy decisions. This data base can also be used for technology assessment studies.

4. *Energy Data Base*—Major emphasis in this program is on material relating to stationary sources and electric power plants in particular. EISO has also been developing an inventory of research and development in virtually all energy fields, including power, heating and transportation using such sources as fossil fuels, nuclear, hydro-electric, solar radiation, geothermal. Problems concerning exploration, mining, refining, conversion and distribution of energy resources are covered. The inventory was recently made available.<sup>6</sup>

5. *Material Resources and Recycling Data Base*—Materials of interest include paper, glass, coal, asbestos, rubber, plastics, fly ash and pesticides. Major emphasis is on solid waste management, including collection, transfer, disposal and recycle potential.

c. EISO can also employ other data bases for batch searches. These include:

1. *Air Pollution Technical Information Center*—Approximately 3,500 items on 13 toxic elements.

2. *Tamplin-Gofman Data Base*—Contains over 10,500 items on radioisotope movement in natural food chains, and radionuclide cycling in the environment.

3. *Air Force*—Over 625,000 references in the fields of physical science and technology selected from foreign literature for the Central Information Reference and Control System, Wright-Patterson AFB, Ohio.

4. *EPA Data Collections*—Including Water Quality Office project summaries and literature on oil and hazardous materials, marine biology, solid wastes and industrial wastes.

d. *Directory Services*—The computerized directory of information

centers, research projects and individual investigators is designed to form the first step in automating the linkage of environmental information sources into a national network. Each entry in the directory contains the name, address and telephone number of an individual, information center, or research organization, and includes a brief text describing the mission, subject, scope and sponsor. For individuals, descriptions include professional work specialties, available skills and even special interests, such as hobbies and community activities. Output of the system can include address labels, address, abstract and keyword information, in various formats.<sup>7</sup>

## SOME ADDITIONAL SERVICES

### RECYCLING INFORMATION SERVICE

A solid waste recycling information service, providing guidance to state, municipal and county officials involved in solid waste management and environmental problems, has been established by the National Association of Secondary Material Industries. The service provides general and technical data on current trends in recycling and developments in solid waste utilization processes, marketing opportunities information, engineering and technological advice, and counsel on the implementation of local legislation for waste recycling. (Requests for information should be addressed to NASMI, Solid Waste Recycling Information Service, 330 Madison Ave., New York, N.Y. 10017).<sup>8</sup>

### STATE ENVIRONMENT DATA

A management system designed to provide environmental information to state legislators is being developed for the State of Louisiana by North American Rockwell Information Systems Company. The comprehensive statewide system is expected to combine various environmental factors such as air quality, water quality, pesticide usage and land use. The goal is to provide decision-makers with "a better understanding of the relationships that exist between these factors and how the total environment will be affected by proposed actions."<sup>8</sup>

### WATER RESOURCES RESEARCH CENTER

This activity recently published a technical report on *A Survey of Indexing and Abstracting Services for Water Resources Engineers*,<sup>9</sup> which is an excellent coverage of this topic.

By this time the reader of this volume is well aware that there is no lack of information or services oriented to the needs of the environmentalist. (Appendix B contains a list of secondary publications and appendix C a list of secondary sources.) The next question is: Which ones are for me? Each person must answer that question alone. Maybe, though, I can help just a bit.

No individual, special library, university department or citizens group could afford to subscribe to all the newsletters, directories, reference books, primary journals, and secondary publishing services which might contain something of interest to them. Even if an activity could afford to do so the time involved in scanning or reading the mass of paper which would arrive as a result of such action would be prohibitive. What is the answer? First the person or group should take a good hard look at its mission so it can identify the information needs which must be satisfied. When these information needs have been identified, then one must identify the sources of information which will best satisfy the needs. It might be advisable to rank them in "contributing" or "satisfying" order. After this is done the available money is allocated to the services on the list, starting at the top and going down as far as the money lasts. One may end up with two or more lists of sources and then must decide again how far the money will go.

There is one benefit to the above approach. In most cases, subscriptions to information services are on an annual basis; one is committed for only a year at the outset. If, as the year goes by, a service does not live up to expectations or its announced benefits, or if there is a re-orientation of basic mission, the subscription need not be renewed. The money can be used for another service the next year. There is another advantage to establishing a priority list and maintaining it on a current basis: if money gets tight, or if extra funds become available, decisions have already been made on what to cut or add.

One word of caution. I mentioned earlier the increasing "birthrate" of environmentally oriented information services. Some of these never quite make it; they bloom for a short period of time, then the petals fall off, and eventually it is difficult to find the plant itself. So if you have limited funds, invest them wisely, avoiding the here-today-maybe-gone-tomorrow type of service. In addition, on a dollar-for-dollar basis governmental services are best, if they exist and provide the type of coverage required in the area of information which will satisfy your needs.

#### REFERENCES

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2. O'Dette, Ralph E., Senior Staff Advisor, Chemical Abstracts Service. Letter dated Sept. 29, 1972.
3. Chemical Abstracts Service. "Information System." Columbus, Ohio State University.

4. Hogan, Thomas H. "BIOSIS: Environmental Information Services." BIOSIS, 2100 Arch Street, Philadelphia, Pa. 19103.

5. Environmental Protection Agency. *Directory of Information Sources*. Washington, D.C., Management and Organization Division, EPA, Sept. 1972.

6. Report ORNL-EIS072-18, Vols. I and II. Available through AEC/contractor channels or a \$9.00 for Vol. I and \$6.00 for Vol. II from NTIS, U.S. Dept. of Commerce, Springfield, Va. 22151.

7. *Scientific Information Notes*. Trends Publishing, Inc., National Press Bldg., Washington, D.C., 4:3-6, no. 2, 1972.

8. *Ibid.*, 4:16, no. 3, 1972.

9. Wellisch, Hans (Hanan). *A Survey of Indexing and Abstracting Services for Water Resources Engineers* (Water Resources Research Center Technical Report, no. 11). College Park, Md., University of Maryland, School of Library and Information Service.

#### APPENDIX A PARTIAL LIST OF COMPENDEX INFORMATION DISSEMINATION CENTERS

Univ. Systems of Georgia  
Computer Center  
Univ. of Georgia  
Athens, Ga. 30601  
Attn: John Gibson  
ITT Research Institute  
3441 S. Federal St.  
Chicago, Ill. 60616  
Attn: Peter Schipma  
Center for Information Science  
Mart Library  
Lehigh University  
Bethlehem, Pa. 18015  
Attn: Larry Davis  
National Research Council of Canada  
National Science Library  
Ottawa 7, CANADA  
Attn: Georg R. Mauerhoff

Royal Institute of Technology Library  
Postadress 10044  
Stockholm 70, Sweden  
Attn: Zofia Bluchowicz  
United States Dept. of Agriculture  
Cultural Research Service  
Plant Industry Station  
Beltsville, Md. 20705  
Attn: Tommy Cooper  
National Agriculture Library  
Data Systems Division  
Xerox Education Group  
University Microfilms  
200 North Zeeb Road  
Ann Arbor, Mich. 48103  
Attn: Linda White

# APPENDIX B

## LIST OF SECONDARY PUBLICATIONS

*Air Pollution Title*

Center for Air Environment Studies

226 Chemical Engineering II

Pennsylvania State University

University Park, Pa. 16802

*Air Quality Control Digest*

University Digest Services

P. O. Box 343

Troy, Michigan 48084

*Analytical Abstracts*

Mrs. H. I. Fixk, Ed.

9-10 Saville Row

London W1X 1AF, England

*BCURA Gazette*

British Coal Utilization Research

Association Information Service

Randalls Road

Surrey, England

*Central Electricity Generating Board**Digest*

Sudbury House

15 Newgate street

London, EC1, England

*Chemical Abstracts*

Chemical Abstract Service

Ohio State University

Columbus, Ohio 43210

*Engineering Index CARD-A-LERT*

Engineering Index, Inc.

345 East 47th St.

New York, N.Y. 10017

*Environment Information ACCESS**(Air Pollution Category)*

Environment Information Center, Inc.

124 East 39th St.

New York, N. Y. 10016

*Fluoride Abstracts*

Kettering Laboratory

Dept. of Environmental Health

College of Medicine

University of Cincinnati

Cincinnati, Ohio

*Fuel Abstracts*

Institute of Fuel

18 Devonshire Street

London, W1N 2AU, England

*Government Reports Announcements*

National Technical Information Service

Springfield, Va. 22151

*Graphic Arts Abstracts*

Graphic Arts Technical Foundation

4615 Forbes Avenue

Pittsburgh, Pa. 15213

*Index MEDICUS*

National Library of Medicine

8600 Rockville Park

Bethesda, Md. 20014

*Institute of Petroleum Abstracts*

Institute of Petroleum Abstracts

61 New Cavendish Street

London, W1M 8AR, England

*Lead Abstracts*

Lead Development Association

34 Berkeley Square

London, W1, England

*Monthly Catalog of U.S.**Government Publications*

Superintendent of Documents

U.S. Government Printing Office

Washington, D.C. 20402

*Motor Industry Research Association*

Automobile Abstracts

Motor Industry Research Association

Lindley, Near Nuneaton

Warwickshire, England

*National Coal Board Abstracts*

Hobart House

Grosvenor Place

London SW1, England

*Occupational Safety and Health**Abstracts*

International Occupational Safety and

Health Information Center

International Labor Office

Geneva 22, Switzerland

*Physics Abstracts*

Institute of Electrical and Electronics

Engineers, Inc.

345 East 47th St.

New York, New York 10017

*Pollution Atmospherique*

Pollution Atmospherique

21 Rue Murillo

Paris, France

*STAR*  
National Aeronautics and Space  
Administration  
Scientific and Technical  
Information Division  
Washington, D.C. 20546

*Zinc Abstracts*  
Zinc Development Association  
34 Berkeley Square  
London W1, England

Source: Environmental Protection Agency. Request for Proposal on "Screening, Cataloging, Abstracting and Indexing of Air Pollution Technical Literature." April 14, 1972.

### APPENDIX C LIST OF SECONDARY SOURCES

*GRA (NTIS)*  
*STAR (NASA)*  
*Pollution Abstracts*  
*Air Pollution Titles*  
*Engineering Index*  
*Index MEDICUS*  
*Chemical Abstracts*  
(National Clearinghouse on)  
*Smoking and Health Bulletin*  
*Zinc Abstracts*  
*Graphic Arts Abstracts*  
*Monthly Catalog of U.S.*  
*Government Publications*  
*Environment Information ACCESS*  
*Abstracts of Air and Water Conser-*  
*vation Literature and Patents (Am.*  
*Petrol. Inst.)*  
*Lead Abstracts (Kettering)*  
*Fluoride Abstracts*  
*Air Quality Control Digest*  
*Analytical Abstracts*  
*Central Electricity Generating*  
*Board Digest*

*Occupational Safety and Health*  
*Abstracts*  
*Fuel Abstracts*  
*Physics Abstracts*  
*Motor Industry Research Association*  
*Automobile Abstracts*  
*OCTEL Exhaust Gas Air Pollution*  
*Abstracts*  
*National Coal Board Abstracts*  
*Institute of Petroleum Abstracts*  
*AIAA Bulletin (American Institute of*  
*Aeronautics and Astronautics)*  
*BCURA Monthly Bulletin*  
*Institute of Paper Chemistry*  
*Abstracts*

Source: Environmental Protection Agency. Request for Proposal on "Screening, Cataloging, Abstracting and Indexing of Air Pollution Technical Literature." April 14, 1972.

KAY COLLINS  
Conservation Specialist  
Conservation Library  
Denver Public Library  
Denver, Colorado

## Regional Environmental Libraries

Not long ago there were not very many environmental libraries. There were a few libraries which specialized in some of the various subject fields, but there just were not very many environmental libraries. Now, it seems to be the hottest topic since Sputnik. The environment itself is a topic which is now responsible for political changes, economic changes and individual lifestyle changes. Therefore, more libraries are beginning to enter into the picture, for many reasons. Some reasons are altruistic, but they run the gamut from personal belief in problem solutions, to public demand, to just trying to get a share of the slowly growing sources of money.

As with other types of libraries, various kinds of environmental libraries are beginning to develop: small collections of magazines designed to meet immediate demands of the public or the group served; and large government collections being expanded to meet new research and policy needs. But this leaves a group in between which is trying to serve a large public on a limited budget. It is well known that the environmental field is a very broad one which touches every subject matter conceivable: pure and applied sciences, social sciences, economics, history, architecture, psychology, even literature, religion and semantics. It is a problem for libraries to fill the gap and supply environmental information, especially as publications mushroom in volume and cost. A small local library is unable to cope with it, and even some larger college, university, and government libraries are unable to do a passable job. They simply cannot afford it; some government libraries are already beginning to feel the economy measures of the Nixon administration. While their budgets are kept low, they are expected to fill the demands of their users for necessary information.

It is becoming increasingly evident to librarians in Colorado that cooperation is the only way they will be able to serve their users. It seems to be true for other geographic areas as well. They are pooling their energies,

collections and financial resources to better serve the people in their region. I will discuss some of these regional efforts. Whether one library serves a region or a group of libraries working together serve a region, the region is receiving service.

A regional environmental library, in general, serves an area larger than a single city, but smaller than a country. Therefore, we can talk about the Denver-Metropolitan region or the Rocky Mountain region. Since these are the two areas with which I am most familiar, I will draw most of my examples from them to illustrate my point.

When the Conservation Library of the Denver Public Library started, more than twelve years ago, it was the first conservation library in a public library and continued to be so until 1972 when Minneapolis opened theirs and Chicago began work on theirs. There were a few private collections of material such as the Conservation Foundation library and specialized collections such as the Forest History Society archives, the large specialized collections such as the Yale Forestry collection or the collections found in the departmental libraries of the Interior Department and the Agriculture Department. But, in general, the hinterlands were left in a big void. The situation is not largely changed today, except for the growing number of users and growing number of small collections which find they must specialize, drop out or join a larger cooperative system. Often they just continue to give inadequate service.

In the West there are already some libraries which serve various sized regions, but these are almost entirely governmental libraries. The Denver Wildlife Research Center library works to serve the western region and cooperates with other wildlife research stations to obtain needed material upon request. When the librarians do not have it, they come to the Conservation Library or may make use of the Bibliographic Center for Research to locate specific material. The same is true of the library at the U.S. Forest Service Rocky Mountain Forest and Range Experiment Station, except that the librarian there works closely with Colorado State University's library in Fort Collins to help serve her users. Wyoming University is collecting archival material, but they find that much of the material they want has been given or promised to the Conservation Library. The Bureau of Reclamation Library, the U.S. Geological Survey Library and the National Oceanographic and Atmospheric Administration libraries also serve the western regions. However, in most instances these libraries do not have the budget to collect everything that is needed by their users—nor should they. If the NOAA library gets only one request for a certain piece of information, or if one of their groups is doing cursory work in an area, such as geology, NOAA should not be buying heavily in that field. But if they know that a few miles away is a library with the needed material and more, they should, and do, make use of that library, whether it be Denver Public Library or the U.S. Geological Survey Library.

However, many libraries and organizations have a tendency not to do this. They have a penchant for building their own little empires which they cannot afford to keep. Therefore, in the Denver area, we are trying to cooperate to define areas of collection specialty and overlap. For instance, the Conservation Library will not collect heavily in atmospheric physics or weather modification technology. It will collect some material on the environmental effects of that program, but little on the technology. It is not supporting a large research program in that area but is serving a public which wants to know the effects of such programs. Anyone coming to the Conservation Library who needs a great deal of technical information on the subject and who cannot find what is needed in the collection, is sent to the NOAA library in Boulder. This leaves money available to buy other materials needed much more and still insures the information in other areas is available.

This procedure is only logical and is presently done on an informal basis. What we would like to do is to make these legal definitions of collection. The three main business libraries in the region have done it, and we are trying to do the same for the environmental field. When we have done this, we also hope to go to various foundations, government agencies and private sources to get funding to supplement our existing purchasing budgets for materials. We feel that by exhibiting cooperation and not competition we have a much better chance, especially since the federal government favors dealing with fewer entities and often gives support to cooperative ones. Getting this cooperation is often difficult, but we are trying.

One of the most promising routes being followed is in connection with a statewide plan for environmental education. I will not detail the many problems encountered, but will try to tell of the positive thrust of the movement.

A group received funding from the U.S. Office of Education to prepare a master plan for environmental education throughout Colorado. I was named to the steering committee of this organization. Working with various environmental organizations, as well as libraries through the state, the highest priority of the plan was given to a call for a clearinghouse for environmental information to serve citizens, businesses, schools, government organizations, etc. These groups are now in the process of further defining the problems in the state, identifying what facilities are already operating, and putting together the means of starting a clearinghouse for environmental information. These actions take into consideration libraries, existing means of distributing information, new means which might be developed, and ways of working within the community to solve problems. One of the ideas proposed is a cooperative effort between several existing libraries to purchase a machine to make microfiche, several fiche-to-fiche copiers, and several fiche readers. The readers would be distributed to libraries throughout the state which did not have them, and rental services on readers would be established.

Requests for environmental information from the cooperating libraries would come into the Bibliographic Center for Research for the Rocky Mountain region. This is an existing organization set up to locate material in numerous libraries throughout the region and the country. Using their location files for material, the requested copy would be located and a microfiche made of it. The requester would be sent a duplicate microfiche; the original fiche would stay with the Conservation Library to fill later requests. Mail and interlibrary loan courier services already existing in the area would be used to distribute the requested material. A collection of environmental fiche would be built up to fill later requests more rapidly. In addition to this, a "neutral" library such as the one at the Conservation Library, would also work within the community to develop a base of other types of information, e.g., when meetings are being held, who has files of material that are current, useful and important but not in any library; who various experts are; who needs what environmental services, etc. This clearinghouse would be an active part of the community by trying to identify needs and bring together the seeker and the server. It would not be outside its realm to set up workshops and supply information to participants. Satellite libraries or clearinghouses could function in other parts of the region to be of more immediate help to that region or act as contact for the central clearinghouse. But by using existing systems, not duplicating efforts and filling in gaps of need, the region will be much better served at relatively little extra cost.

Together there can be power, efficiency and better service. If one can avoid the empire building and threatened egos involved, a regional system is often a more secure, efficient system. No library can fill everyone's needs. They are going to need help. For instance, the use of the expensive on-line computer search systems would not be available to one library unless they were shared. What Sarah Thomas and the EPA have done is wise; many of us can learn from her. If we pool our resources, some of us could have these sophisticated capabilities available, but we are going to have to share to keep the costs within reason. The various environmental libraries are beginning to look at shared on-line systems and cable television as a means of linking libraries with each other and their users. The possibilities are becoming available, we just have to know what they are and take advantage of them.

Another area that some environmental libraries are trying to push is an old one, common to many libraries—storage of the old, little used, but still important material. Most libraries, like public libraries, look for a place to store their old materials, and the library in the neighboring community looks for space to store the same old books. One step in solving this problem is naming one library the central storehouse. This library will keep the one needed copy of the publication and the rest of the libraries will come there for it when it is occasionally needed. One further step along these lines which

we are working on is the placing of this material on microfilm or microfiche. This does not then necessitate a new building to store it in, only a series of microfilm cases. When the copy is needed, a microfilm copy can be sent and no loan privileges need to be worried about if it reproduces cheaply enough. This is an adjunct of the microform distribution and collection described above.

By using existing systems, by trying to put more on microform, and by working more closely with the various communities, the environmental libraries of my region are working toward serving a larger community with more information more rapidly. It is just beginning and is not always easy, but the start is made and many people are becoming committed to it. It is not new or exciting, but it is a start which libraries must make to be able to stay in the environmental information field.

ANGELA IMBERMAN  
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Illinois Institute for Environmental Quality

## State and Local Environmental Information Centers, Facilities, and Services

The federal Environmental Protection Agency has already kindly provided the first edition of a catalog of state and local environmental libraries.<sup>1</sup> However, I wish to provide more than such a catalog. As you may have read in Schneiderman's paper, there are both active and passive library roles to be played. I will concentrate on discussing the possible active roles of an environmental library after I dismiss a few of the passive items.

Browsing through the EPA listing will give you an idea of the range of libraries dealing both generally and specifically with environmentally related materials. Naturally, each state library will collect some environmental journals, books, and conference proceedings. Some state governments which have established either a natural resources department or an environmental research agency have started environmental collections (e.g., Arkansas, Delaware, Michigan, and Illinois). Small, local public libraries try to collect mostly nontechnical, lay reading material on the environmental crisis. In addition to these types of libraries, we must remember to take advantage of all those special collections which may be considered national or regional, but which are also frequently local. For example, unless one lives in Santa Barbara, California, the Oil Spill Information Center there may be unknown. Another narrow subject area is dealt with by the eutrophication program at the University of Wisconsin's Water Resources Center. (A future edition of EPA's directory might contain a subject listing of special collections.) Without assuming to speak for all special libraries, one may say that most of them are happy to serve by phone or mail. Professional associations and foundations ranging from the Conservation Foundation in Washington, D.C., to the American Foundrymen's Society in Des Plaines, Illinois usually have libraries or information centers with very specific environmental information available.

Librarians are traditionally passive, both in waiting for people to come to them and in hoarding all they can get in one place. We must break out of both molds. Information networks and cooperative systems have been discussed for decades. Some are working; others languish; and many never start in spite of years of meetings and talking. Perhaps the problem is that we, with scarce money and people resources, are too busy with our own work to set up systems. Perhaps we already cooperate well as a "closed college" among ourselves, but whenever we try to formalize a structure for cooperation, our structures break our friendly spirits. Whatever the cause of the problem, we should cooperate more in whatever either flexible or formal structure we work best. The university or large public library which has bought an expensive *Particle Atlas* and marked it "reference" should let whoever needs it, use it. Each library, no matter what it purports to be or have, cannot have everything. Let each one collect the type of material it collects best.

One example of how this sharing of resources can be accomplished is illustrated by a project going on in the Illinois Institute for Environmental Quality's (hereafter Institute's) library. From the beginning of the project we have intended to produce a union book catalog for environmental collections in Illinois. It will be computer-produced, and will contain the current acquisitions of the Illinois State Library and of the Institute's library in its first edition. We should be able to integrate it with the EPA's catalog at some future date. Any substantial environmental collection in Illinois is qualified to participate in the second edition. We contemplate distributing this catalog widely—to government agencies, citizens groups, libraries, or anyone who can make good use of it. We should learn more about its potential use when we do a pilot distribution of a solid waste section early in 1973. A union catalog of resources is only one way to start a cooperating information network—what I have been describing above.

Networks for all kinds of subject information are important. Many libraries have joined regional systems for interlibrary loan cooperation, which is the first step. I contend that at least we in the environmental business, if not all others, need an information network made up of data and information generators, users, and controllers, i.e., researchers, consultants, citizens, students, educators, librarians, information scientists, etc. While with current strong efforts to aid the environment and potentially stronger future activity, we may not need to feel that all environmental concerns are of crisis proportions anymore, there is a more acute immediacy to environmental problems than in many fields.

A good deal of the environmental information needed already exists or is being discovered. In addition to the Library of Congress National Referral Center, we need an environmental hot-line. There is a national consumer information hot-line.<sup>2</sup> So far, our "closed colleges" of environmental libraries

are as close as we have come to such a hot-line. Again, we do not need one place which has everything or one person who knows everything, but we do need an instant hot-line network of resources. We were hopeful that the EPA would be assigned a central responsibility for coordination of environmental data bases after the National Environmental Information Symposium in Cincinnati, but evidently this will not happen. Further behind-the-scenes and legislative efforts need to be made during the next Congress to coordinate and centralize environmental data bases at the federal level.

Even without such a federal mandate, state and local efforts can be made now, which will eventually be used to fit into the larger scheme of networks. Some of the Institute's efforts over the past two years, although perhaps not consciously, have dealt with the network problem. The union catalog is a prime example. Our project list, which is issued several times annually, is an attempt to keep others in our state and around the country apprised of all research efforts in order that they may avoid duplication, if possible. Distribution of our generally applicable publications through NTIS with its weekly *Environmental Pollution and Control* alerting service is indeed participation in a national network.<sup>3</sup>

Other Institute networking efforts have resulted in other publications. Partially because of requests to the library and to the Institute staff responsible for solid waste management projects we feel that there is a need to help environmental groups, particularly small local ones, to find each other. The recently published *Directory of Environmental Groups in Illinois* resulted from this need. This kind of inventorying will also help planning in other areas, particularly education. A local Chicago directory, done by the Open Lands Project, was used in developing this statewide listing. I recently received a national listing, "Groups that Can Help," from the EPA. There are many other directories of environmental organizations and groups available. All the pieces of the puzzle do start fitting together.

For people who wish to do something positive as individuals to join in an effort to conserve resources, recycling has become a popular, if not yet perfect, outlet. In order to help these efforts be successful, the Institute recently published a *Directory of Markets for Recyclable Materials*. The directory should be more and more useful as it is improved in successive editions. We have considered publishing a directory of recycling centers. However, because of the effervescent nature of recycling centers, we have concluded that the directory would be out-of-date very quickly and not worth the cost of printing. In response to the need for such information, I would still like to establish a master list of recycling centers at the Institute (or elsewhere), so that anyone knowing of a center could let us know about it, and anyone wanting to know could ask us. Perhaps a meeting of all those running recycling centers in Illinois would produce a useful master manual on

how to establish and run such centers. As Schneiderman in his paper in this volume suggested, I will try to fulfill my role of Institute librarian by continuing to push from the inside for these additional services.

Our master networking effort is aided by a portion of the Illinois Environmental Protection Act which requires us to hold an annual conference. This conference must assess the progress, or lack of progress, in achieving environmental quality in Illinois during the past year. As the second conference is currently just in the early planning stages, we intend to use it to great advantage to get appropriate people together. We see a slowly increasing amount of cooperation among the industrial, educational, and government sectors, but conferences such as ours, if well-structured, should help increase that rate of cooperation.

It is obvious that an environmental library, which is a part of a small, well-funded organization, can take a very active role in shaping policies and activities of that organization. It might be far more difficult for a university or public library to be so influential. However, one area in which any library can naturally take an active role is education. After all, education is the librarian's *raison d'être*. Again, with sufficient funds, a library operation can help to launch rather expansive programs. We have recently completed distributing a packet of environmental education materials to each elementary school in Illinois. The items in this packet were carefully selected by a group of teachers and environmental experts. At least one item missing in that packet was a complete list of environmental education materials available with an evaluative abstract for each item. A bibliography, *Children's Books on Ecology* done by the staff of the Chicago Public Library, was included in the packet. More could be done. Particularly, a children's librarian could help the schools in a local or statewide cooperative effort to develop such a resource listing for distribution.

I know that librarians are busy people. Many are fully occupied in ordering books, cataloging, and answering walk-in reference questions. But also, they have great responsibilities to make sure that information which they so carefully guard and store is used. Whether the librarian's community be a town, school, or university, there are many ways to get involved in helping the constituency improve the environment. I know from the large number of inquiries that we get that few libraries have accepted the challenge. We see an increasing number of environmental councils being formed locally as part of the city government. In order to make informed decisions, those committees should be actively offered the use of local libraries and ready access to networks of environmental information. The city of Winnetka, north of Chicago, will sponsor a half-day conference in the spring of 1973 on the water quality of Lake Michigan—particularly for swimming. The local library could be a valuable preconference interest-generator. It could help find resources, be

a part of the program and spur continuing interest after the conference. The local school librarian could actively play similar roles for her public.

Because of the Institute's involvement in preparing master plans for elementary, secondary and higher education in Illinois, we are well aware of the multitude of federally funded projects and of curricula and special courses being designed for all levels of education. Librarians could and should be active members of committees planning these projects. One of the primary problems of these new projects is that documentation of their development frequently is not disseminated. Since the federal government has not assumed that dissemination responsibility, librarians, through their own organizations, could send reports and materials from local education projects at all levels to a central clearinghouse. This is just a suggestion, but it might work!

The problem is that none of us has a clear mandate to do everything. Should the local community assume responsibility for all of its environmental problems? Should a small, local citizens group make a project of tracking down all recycling centers within a state? Should a university library, in connection with a new environmental studies department, operate in a vacuum and assume that it is the only resource for those students, or should it attempt to apprise itself of other resources and make the students extraordinarily aware of them? There is no reason for any group with resources not to do something. But they should be aware of what has been done and is being done, and how what they choose to do fits into the "big picture."

I close with the following pleas to librarians:

Do what you do best.

Coax others to do what you cannot.

Use all the resources available.

Form or think networks!

Cooperate!

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## Federal Resources and Environmental Programs

Americans in a crisis situation have traditionally turned to public schools and their colleges and universities—to education—to help solve large social problems.

Environmental education has been described as a local answer to environmental problems. Community schools, meaning education at all levels is expected to influence or guide most local environmental programs. Strong student concern for the decline of environmental quality has assisted in placing environmental education and reform at the forefront of school and college priorities. Also “environmental concerns offer an attractive neutral ground for an alliance between generations, the young and the old.”

Education as a means for ending the degradation of the environment as it affects individual quality of life has reached into the libraries throughout the nation. A week seldom passes that I do not receive a call from a public or college librarian requesting information about potential sources of funds for resource development in the environmental sciences.

Most frequently, the caller has not really developed an idea for a project responsive to an identified community environmental need. Environment is “in” (as any capable grantsman knows), therefore success potential, even for a poorly developed idea, will, callers believe, get attention. Too many of these requests are simply pipedreams for acquiring funds for purchase of resources. If there really is a specific local need, the regular selection policy of the institution should already be responding to the need through the local budget.

Therefore, if you do wish to practice grantsmanship in the race for federal program funds, here are two things *not* to do:

1. Do not request funds for resources unless you are relating the resources acquired to a special delivery system for disseminating environmental information to a target group.
2. Do not manufacture a need.

Two things to do are:

1. Do learn of needs and problems in the community as these relate to environmental resources.
2. Do assess other programs, planned or operational, and identify ways that the services and resources of the library may assist these either directly or through development of coordinated auxiliary programs.

The U.S. educational system, of which libraries are a part (as is the school or college classroom, has a key role in causing environmental reform. "It is vital that the society develop a new understanding and awareness of man's relation to his environment. Understanding rests on a foundation of knowledge gained from comprehension of information." Very few teachers and professors are creating knowledge; more generally they are interpreting information. The library can be, and is, a frequent and regular source of this information.

President Nixon recently emphasized that "we need new knowledge, new perceptions, new attitudes," in American education. Relative to environmental education, libraries have obvious opportunity and responsibility to establish convenient knowledge banks of environmental information. Equally important is for libraries to recognize existing needs for insuring that the knowledge bank is used, and used for causing new perceptions and new attitudes.

Environmental education is directed at modifying man's attitudes toward his world—both the world of nature from which he derives and inherits his responses and the world which he is creating.

As attitudes are reflected in the democratic process, both at the polling booth and in the market place, man must recognize that whatever happens or is not permitted to happen to his world can be substantially influenced by a majority vote.

Herein rests responsibility for the library—a democratic institution housing and delivering information which will cause an informed individual to rationally exercise his democratic right to cause compatible, continuing existence within the limitations of his environment.

The library, as it has been in many other areas of social concern in the past, is a catalyst for triggering man's reasoning. "Environmental awareness comes before environmental protection," states Freddy Schader in *A Bibliography on Environmental Education* published in 1972 by the Arkansas Library Commission. Responsibility for environmental education thrust in order to cause responsible environmental awareness is not a job only of federal and state governments, nor can the school system offer a panacea. Responsibility is shared by the church, professional associations, civic organizations, voluntary agencies and the family. It is these latter groups which provide the greatest opportunity for libraries. The library has long held potential for providing opportunity for a forum whereby knowledge about

issues is gained, rationales developed, and strategies formulated. Too frequently libraries have stopped short of this opportunity. Libraries of all types and at all levels have been enraptured with the acquisition and organization of informational materials about issues. They have long recognized that print and nonprint media are a major means for communications and have expected their general or specific publics to "come and get it!" Rarely have they developed programs which could make the library a true communications center where users could not only acquire knowledge from inanimate objects, but also communicate among themselves.

The library on mainstreet or the campus has an obligation to go beyond the resource center concept. If it is to have a direct effect on causing public awareness and a role in rational attitude formulation, it must create opportunity for its constituents not only to gain knowledge, but also to exchange knowledge, formulate solutions and organize strategies for utilizing the solutions. If a library is to enjoy successful grantsmanship in pursuit of the federal or state dollar or private funds, it should consider:

1. Its own resources or resources available for its utilization for assessment of the environmental needs of its constituency.
2. If resources for the assessment process are not available, the library may strive to acquire these through:
  - a. recruitment of the needed personnel;
  - b. contract with a qualified organization; or
  - c. soliciting volunteer services of interested individuals or groups.
3. If the resources for the assessment process cannot be acquired, the library should strive to affiliate with an agency, organization or department having the necessary capability.
4. Subsequent to achievement of a reliable assessment of community environmental needs, the library is ready to initiate the interpretive process for:
  - a. ranking these as to priority; and
  - b. recognizing constraints and selecting the priority need for which the library may create programs for causing solutions. (All steps are important—but none more so—if an effective program is to be developed and delivered.)
5. Following selection of the target priority, the library engages in program planning. Are the priorities of a scope or nature requiring research prior to creation of the program strategies, or for creating public awareness and subsequent attitude change; or does the priority lend itself to direct attack strategies?

I doubt that many libraries will directly supervise clearance of debris

from a stream, wilderness area, or ghetto street, although they could organize such activities. It seems more appropriate that they should provide the information and forum for causing these activities—again, the catalyst, not the purgative.

6. After completion of program planning the library must:
  - a. assess its resources, human and material, for delivery of the program;
  - b. attempt to market the program to another agency or group having the capability;
  - c. allocate funds or acquire funds for development; or
  - d. a combination of these.

Too often this last step is inadequately considered and the agency jumps directly to trying to acquire funds from outside sources, usually federal, state and foundation—and generally in that order. If the need is truly one that is or should be a community (meaning campus, city, etc.) priority, is it unreasonable to expect that the priority should also have priority for allocation of some funds within the institution's own budget?

Grant proposals which have undergone the preceding processes leap out at those who determine awards. An aura of the genuine is present; the need and the proposed strategies for achievement of solution or objectives ring with credibility.

It should be pointed out that the Environmental Education Act does not prescribe a massive federal education program which state and local communities will follow. The act merely charges the Office of Education to "encourage and support" environmental education.

When searching for federal funds for support of environmental projects and following the assessment-planning processes, the appropriate official may contact the nearest regional office of the U.S. Office of Education's environmental liaison officer and/or library services program officer. The *Catalog of Federal Domestic Assistance* should be carefully studied to identify appropriate federal programs which may hold funding potential. A proposal may cross several federal programs, particularly if a group of institutions, schools, and organizations are to be its sponsors. Such conditions mandate true grantsmanship and have possible potential under the Integrated Grants Administration Program and the proposed Allied Services Act.

The environmental education program in the USOE is a response to the growing concern over the crises which threaten our survival. Overpopulation, mismanagement of natural resources, and pollution of air and the water are a few. With 70% of our people occupying 2% of our land, we have created what I call the cluster environmental crisis situation.

The Environmental Education Act of 1970 is attempting to respond to

these and other environmental challenges. The Act calls environmental education . . . the educational process dealing with man's relationship with his natural and manmade surroundings, and including the relation of population, pollution, resource allocation and depletion, conservation, transportation, technology, and urban and rural planning to the total human environment.

In 1971, nearly 2,000 proposals were submitted to the U.S. Office of Education under the Environmental Education Act. Seventy-four grants in thirty-one states were awarded. The initial grants assisted educational programs which support community problem-solving, environmental improvement and protection, and ecology centers, museums, and libraries. These efforts were intended to initiate a synergistic approach to environmental education by *redirecting funds available* under other legislative authority. Thirty-seven projects were funded under the ESEA, others under the EPDA, and others under the Higher Education Act and the Cooperative Research Act.

Traditionally known library programs holding potential are LSCA, HEA Title IIA and IIB, and, of course, ESEA Title II, depending on plans and priorities of state departments of education.

A real opportunity exists under LSCA which recently required the preparation of state long-range programs for library development for all types of libraries with the requirements that these programs include plans for the coordination and development of resources of academic, school and public libraries. Of the fifteen long-range plans I have read, several mention library programs directed toward environmental resources or education. None include a comprehensive plan for libraries in environmental education. It is suggested that these documents, now undergoing revision in many states, should be carefully examined and initiatives taken for development and inclusion of a comprehensive plan for libraries in environmental education. These should be "action" plans and not limited to passive support of programs of other agencies.

Title III of the LSCA calls for networks (including all types of libraries) to coordinate development of resources and for the sharing of resources. This title holds the key for development of such a plan. The required plan, or long-range program as it is officially known, must include the development of services to meet people's needs and the delivery of such services through all types of libraries. Therefore, there is the opportunity boldly to utilize planning strategies included in such prominent social concerns as environmental education. Interlibrary cooperation has its greatest potential in those areas which meet needs of clients of libraries (public, academic, school and special) which are of common concern and needed by all. Environmental education is certainly one of these needs. It is also something most libraries previously have not included as a priority operation; and something that had not been given much prior attention. The greatest potential for cooperation rests in such areas.

The concept should be extended beyond cooperation with our neighboring libraries and be inclusive of other appropriate agencies and organizations. Other federal programs, a few of which have been mentioned elsewhere in this volume, offer opportunity for training and resources to support cooperative initiatives.

Since the nation's environmental concerns extend beyond education and include health, industry and transportation, to name a few, libraries should examine new federal program opportunities. Important among these opportunities are the relatively new Integrated Grants Administrations Program, and proposed Allied Services Act and the very new State and Local Assistance Act, better known as "revenue sharing." Although the "education revenue sharing" legislation is pending, the SLAA does now provide potential opportunity for city, county and state agencies.

The proposed Allied Services Act would give state and local government greater legal freedom and planning tools needed for the long overdue job of modernizing and consolidating the delivery of social services and programs. It would permit knowledgeable state and local people to break through rigid, categorical walls to open up bureaucratic compartments, to consolidate and coordinate related programs and a comprehensive approach to related social aid problems designed to match widely varying state and local needs. Under the proposed legislation the federal government would make funds available for the costs of developing consolidated plans and would also be prepared to underwrite the administrative startup costs when the comprehensive services programs went into effect. The stated purpose of the legislation is "to encourage and assist states and localities to coordinate their various programs and resources available, to provide human services in order to facilitate the improved provisions and utilization of those services and increase their effectiveness in achieving the objectives of personal independence, economic self-sufficiency, and the maximum enjoyment of life with dignity, and for other purposes."

The Integrated Grants Administration, according to Secretary Elliot L. Richardson, will do the following:

Cut away red tape, grant packaging, and grant consolidation, make federal support less hampering and more useful. . . . Its aim is to make it easier for federal, state and local governments to work together to deliver services to people in a coordinated and effective way. It will help to build the capacity of service providers for joint plans and operations across program lines to alleviate conditions of dependency. It will also widen the flexibility of federal support for state and localities through provisions for transfer of federal funds between programs, waivers of inconsistent federal program requirements, and limited funding for planning and administrative cost. In turn, state and localities will organize themselves to provide services to their citizens in a more comprehensive and cohesive manner.

The Title III of the LSCA, coupled with these new or proposed

opportunities and building upon older opportunities such as HEA IIA, LSCA Title I and ESEA Title II under a comprehensive planning approach, offers libraries realities for development of service initiatives to deal with environmental concerns, education and otherwise. The library community which is not holding a plan in hand or does not have one in forward stages of development in readiness for funding opportunities, cannot be expected to fare well. Federal assistance, although the competition is great, is always good for the library which has genuinely assessed the needs of its constituency, established its priorities and examined the community's resources for meeting the need.

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## The School Media Specialist as Activist

Concern for the quality and future of our environment has brought together representatives from a number of disciplines and interests and has prompted many people and organizations to foster an awareness of the crucial status of Spaceship Earth, to identify emerging patterns that are threatening, and to suggest some of the options yet available. The proliferation of information about the environmental crisis and the promulgation of diverse points of view have resulted in a plethora of materials, if not another form of pollution.

The program of this Institute was launched with a lecture defining the scope of the environmental problem, progressed to the work and publications of various agencies, institutions, and organizations, and proceeded to descriptions of facilities and the services of information centers. Our focus now shifts to creating guidelines for the developing of environmental collections in different kinds of libraries. Our charge is to devise means to cope on the local scene with the resources available and to suggest ways that responsible evaluation and selection of materials can lead to the development of collections which hold promise of being utilized by the community served.

The environmental crisis is a topic both intriguing and disturbing. Many who work with youth are finding that the subject enjoys a universality that spurs communication among people. Since apprehension concerning the problem spans the age spectrum, young people have participated in programs of action not only with their peers, but with others of all ages. The threats of various pollutants to our survival give an urgency to the examination of our environment which unites people along lines not distinguished by age. The public has been alerted to the issues and controversies by the mass media; the many facets of the crisis have been highlighted in books, periodicals, and television programs. Young people have responded with alacrity.

In schools the study of the environment can permeate various aspects of the curriculum and experiences of the students. Concepts and understandings about the environment have been tucked into niches of existing courses of

study. Another approach has been to create new courses, frequently interdisciplinary, with the pivot being the study of the environment. Teachers, students, and administrators who are not constrained by traditional divisions of knowledge seem able to absorb more readily this new input. Organization of schools by departments or grade levels and approved syllabi need not inhibit the study of the environment. People who can transcend existing frameworks must be called upon to assist incorporating environmental studies into the curriculum. One of these persons should be the school media specialist. The media specialist who is conversant about curriculum development, theories of learning, and teaching strategies can draw upon a wealth of resources and materials to support his or her efforts to promote the study of the environment in schools.

In this article the ferment enlivening the field of education today, which has implicit meaning for environmental studies, will be briefly sketched. This presentation will be directed toward delineating the role of school media specialist in evaluating and selecting materials and in stimulating people to utilize media effectively. Environmental studies as opposed to environmental sciences will be used in a conspicuous effort to call attention to the need to interpret broadly this topic in the schools.

## THE EDUCATION SCENE

Certain vibrations concerning environmental studies are on the same wavelengths as some of the tremors being created in the education world by the professionals who are raising inquiries about learning processes. Many of the issues regarding ways to improve learning are typified in the current stress on environmental studies. The opportunity is presented to experiment with theoretical concepts about learning at practical levels.

The emphasis of many reports and studies is on facilitating learning for the individual. The slogan now is "education for each," rather than "education for all." Teachers are encouraged to find means to permit the student to pursue portions of his study independently. Due regard is given, however, to providing for interactions among students and between student and teacher. Guidance is offered by the teacher, but the student is afforded options to personalize learning. Intrinsic motivation sparked by the student's interest in an activity seems to transport the learner more easily through his endeavors and to make learning exciting. Recognition that each person has different modes of assimilating information has led us to suspect that one might switch his modes under varying circumstances.

Knowledge is more accurately described as dynamic than static, transitory than permanent; we are constantly forced to absorb new information and revise established facts. Process becomes more important than

content because content has little stability. The ability to inquire skillfully, to solve problems, and to resolve dilemmas will better condition the student for future encounters than the reiteration of current certainties. Even styles of inquiry can become obsolete. The organization of subject matter within courses of study is being scrutinized. The categorical and sequential frames of reference are being realigned. The interrelationship of former classifications of knowledge finds expression in attempts to provide interdisciplinary courses and to develop units around universal themes.

Openness is the new trend in education. Harold Howe, in a lecture given at Yale University, stated that the open classroom is much more than a challenge to old rigidities.

It is an effort to enlist the student in the cause of his own education, to turn the situations he creates for himself and the personal interests he expresses to the purposes of learning. It tries to find in play situations and in activities that come naturally to children opportunities to implant important lessons. It is an attempt to organize the class so that students can learn from each other, to change the teacher's role from that of performer to that of a guide and a diagnostician of learning problems, and to bring into the class as sources of stimulation to learning anything that interests children from the world outside.<sup>1</sup>

The twelfth Herculean task seems to be that of coping with values. The dearest traditions are questioned and challenged. No longer is the weighing of pros and cons limited to adults; children and young people are given practice in making value judgments. The classroom becomes a forum where students can observe that proposals from one segment of the society might not be acceptable to others and that there are reasons for accepting or rejecting certain solutions. Exposure is given to several sides of an issue; experience is gained in the critical evaluation of conflicting value positions. The right of the individual to develop his own value system is championed. Affective learning is linked with cognitive. All of these views of learning mandate new teaching strategies.

Environmental education has been described as education that cannot wait and education which will require new approaches. Mankind has a record of making decisions about use of the environment upon such bases as custom, oversight, economic feasibility, political expedience, social desirability, and religious belief. Wise decisions will of necessity require understanding not only of pure and applied sciences, but also of economics, history, political science, sociology, psychology and the humanities.<sup>2</sup>

The scope of environmental education is clearly shown in the June 1970 issue of *Theory Into Practice*, entitled "Toward a More Humane Environment." The articles concern the natural and artificial relationships between man and his environment, and moral and ethical issues of this relationship. Theological, educational, and legal questions are asked which have implications for educational practices and trends.

Many studies have been made regarding the status of environmental education and many groups have mobilized to insure the study of the environment in the curriculum. The purposes of this paper do not allow for lengthy descriptions of these projects; brief mention of two items will be exemplary of many others. *Environmental Education in the Public Schools* is a report of the results of a survey conducted during the 1969-70 school year to determine the status of environmental education.<sup>3</sup> Since the study was made when interest was beginning to heighten, the report should be useful in the future for purposes of comparison to determine trends. The National Education Association has several groups concerned with environmental education. Many publications have been prepared and a Task Force on Environmental Education has been appointed. The NEA catalog of publications will provide the necessary information for ordering materials from this organization.

The surface has been but lightly scratched with regard to the excitement of being in the field of education today, and the special meaning environmental studies have to new approaches to learning. In an article in the bulletin of the National Association of Secondary School Principals, George O'Hearn encapsulates many of the points sketched above. He summarizes:

The basic guidelines for environmental education include orientation of school programs toward the future; wider acceptance of problem-focused learning, concern in all areas of the curriculum for the human element—man in society, a pan-discipline approach to learning and decision making, a school program that encourages student initiated learning, and acknowledgment that all education and especially environmental education requires a “whole world” approach to learning—learning for survival.<sup>4</sup>

## EVALUATION AND SELECTION OF MEDIA

Materials found in school media centers today differ from earlier library holdings in at least three dimensions: (1) supplementary textbooks have been either displaced or augmented by books which offer breadth and depth in their treatment of topics and are intoxicating in their appeal; (2) collections determined by or limited to materials supporting a pedestrian course of study have given way to multifarious assemblages as colossal as life itself; (3) to the collections of books and magazines have been added other media including recordings, films, filmstrips, slides, and transparencies. Media centers across the country could be cited at different stages of this seemingly evolutionary process, and there is little to suggest that trends will be reversed. The emerging of environmental studies serves to substantiate the need for the transformations which have been occurring.

Criteria to assist in the determination of materials to be selected for school collections are exceedingly difficult to fashion. The range of abilities

among students and the levels of their maturation and sophistication, the ever-expanding approaches of teachers to students and to studies, and the leadership of media specialists in promoting diversity, have left few materials to be eliminated. The safest criterion seems to be one which allows for the inclusion of any item for which a use or need can be determined. Financial circumstances impose limitations upon the amount of money to be spent, but have little bearing on the reshaping or re-ordering of criteria. Fewer items are purchased, but the range of materials selected for inclusion has not been constricted.

The American Association of School Librarians in its "Policies and Procedures for Selection of Instructional Materials" has suggested that criteria for selection should reflect the basic objective of the media center—to implement, enrich, and support the educational program of the school. General criteria should be cast in terms of significant descriptors of the subject, integrity of treatment, quality of medium or style, clarity and originality. Specific criteria are determined by the program of the individual school and the needs of the students. The guide provided by AASL further suggests that needs arising from knowledge of the curriculum, knowledge of children and youth, and requests of students, teachers, administrators, and parents will require a wide range of materials for an acceptable level of quality, on all levels of difficulty, with a diversity of appeal, and the presentation of different points of view. Most assuredly those who developed these guidelines are to be commended for their vision and understanding; however, those who attribute an inclusiveness which has few bounds to such terms as "comprehensive" and "curriculum" wonder if there is anything which could not be justified for inclusion in a collection.

In an open society the individual's right to his opinion, coupled with technology which permits the rapid dissemination of points of view, further complicates the task of selecting materials. The deluge of publications becomes overwhelming. The media specialist who sorts out of this avalanche items for his collection which are factual and rejects those which are biased is, perhaps, making judgments not entirely void of the influence of his own personal views. Furthermore, materials considered to be inferior or slanted can, in the hands of some professionals and students, help to put into perspective the diverse viewpoints about issues.

Bibliographies prepared by subject specialists and standard sources which have been relied upon for recommendations are no longer entirely satisfactory to the media specialist who is building a collection to meet the distinctive needs of an individual school. This is not a denouncement of the bibliographies; the lists continue to be useful, but the reasons for consulting them have altered. Many school collections have grown beyond the number of titles a general source can suggest without becoming unwieldy as a reference.

Bibliographies of the "best books" variety are susceptible to criticism unless the purposes for which the materials are best are carefully delineated. Before lists even roll off the press there seems to be a need for updating, whether the topic relates to ancient history or environmental studies. Exhaustive lists frequently provide a beginning reference, but contain so many materials that culling out items for a particular circumstance becomes difficult. Selective bibliographies and those intended for specific purposes are useful only if a user's intentions are similar.

Thorough evaluation of materials by the media specialist is not so paramount as his envisioning the ways in which materials might be used. The responsibility of the media specialist lies not in deciding which materials are best, but rather in providing materials which will be useful in a variety of instances. Evaluation and selection of materials within budget limitations become arduous for the elastic mind from which circumstances of utilization pour forth. For example, some recent films have been produced primarily to arouse interest and concern; many of these films are open-ended. Were these films judged solely by the amount of factual information contained in x running minutes, they would be rejected. Some teachers will dismiss these films as useless; at the other extreme will be teachers who will use the films as launch pads for many learning experiences. The media specialist must consider the diverse opinions of teachers regarding the usefulness of the films and decide which films are to be selected for the collection. He must be capable of responding to the entire continuum of teaching strategies and of helping each teacher to see the validity of other methods.

## UTILIZATION OF MEDIA

The media specialist promotes the utilization of media to improve learning. To be of assistance in creating a learning environment for students, the media specialist must have, in addition to his knowledge of media, a knowledge of the goals and objectives of the curriculum and how to work effectively with teachers. To utilize collections fully the media specialist must be able to suggest ways to use materials creatively and be able to pull from the collections or sections of the media center those materials which will prove most satisfactory to the public he serves.

The media specialist continues to respond to requests for specific materials for use in the classroom, but the involvement with the teacher is of an increasingly more intensive nature. At the outset the teacher and media specialist must discuss the scope of the topic and the direction the teacher plans to go with it. Environmental studies provide an excellent example of the need for deliberations between teacher and media specialist before the search for materials begins. How is the teacher interpreting environmental studies? If

one sought a definition from a number of people, the responses would approximate the number of people asked. There would be no merit to placing judgment upon the definitions proposed, nor would there be any need to derive a single definition from all that had been suggested.

The interface between teacher and media specialist regarding scope of the topic is crucial to the success of the search for materials and, when neglected, can make succeeding steps futile. I am reminded of a library science class in which students were to develop responses to a request for materials concerning environmental studies. An important aspect of the assignment was the discussing of definitions of the topic. Before the first group meeting had concluded, the students had divided the search for materials by categories typical of the approach of one who assumes he knows the limits of a topic. When forced to seek further for definitions and interpretations of the subject, the students became aware that they had not explored in even a rudimentary way the possibilities that environmental studies could encompass.

There will be teachers who will prefer and will be satisfied to obtain from the media specialist specific titles as requested. If, however, the media specialist is to be an integral part of the process of curriculum development, he will respond to the request, and then attempt to probe the direction the teacher is taking in order to suggest how the topic could possibly be expanded or brought into sharper focus. Ways must be sought which will enable the teacher to create in his class an arena in which the subject can become exciting to students, which will allow students to explore independently, and which will provide a sense of unity to the various probings of the topic.

The relationship of the teacher and media specialist must be one of mutual exchange which places new demands upon the media specialist. The person of limited knowledge and narrow perception whose expertise lies in finding subject headings in the card catalog cannot thrive as a media specialist. The defining of the topic is not a semantic trick, but a really significant part of the information with which the media specialist will need to fortify himself before gathering materials.

Collections of materials already in the media center have probably not been fully exploited. Our collections and resources could probably be utilized to greater advantage. The November 1972 issue of *Educational Leadership* features the use of resources at the local level. This theme was selected because many resources, some valued and some neglected, are generally available at the local level. The emphasis of the issue is on the need for alertness in recognizing the hidden value in resources and the need for inventiveness and flexibility in the utilization of resources. Although the resources of a media center are not discussed in the issue, the decision to feature this topic is interesting to the media specialist who must seek to utilize collections creatively. The media specialist must know the resources in his collections—must know more than

the backs of books—in order to connect the student or teacher with the item most germane to his request. To know thoroughly and exhaustively the contents of every piece of material is impossible, but the media specialist must maintain a perspective which makes him or her, when confronted with a request for materials, think immediately of possibilities beyond a few call numbers, subject headings, or titles.

The media specialist should not peg or condemn materials too quickly to a specific audience. Less difficult materials can be used by secondary school students in some of their projects in elementary schools. The secondary student helping the elementary student might be the advanced learner who is taking on a special project or might be the less advanced pupil who is, himself, gaining knowledge through preparing a presentation for the younger person. The same materials might contain information which would help to clarify points a high school student is trying to present to adults of the community. While cover-to-cover utilization of some materials might prove difficult or taxing, sections of items can be interpreted by the teacher for the student or be used independently by the student because of their brevity or format. Quite often then, the utilization of materials is dependent upon the creative thoughts of the media specialist. It is the role of the media specialist to help and inspire students and teachers to see many uses for any item.

The ability to suggest creative uses of media will also enable the media specialist to respond immediately to requests. Although materials are constantly added to collections, almost everyday a request is received for something which is not a part of the collection. If the media specialist can think of substitutions which might even please the teacher or student more than the item originally requested, new service links will be established which will soon be used by the patron again. Fuel for reacting more positively to daily requests can be found in collections characterized as having breadth and diversity.

The media specialist is better described as a coordinator of resources than a dispenser of materials. An important resource in any school is the faculty. The media specialist needs to draw on the abilities and talents of the faculty. The science teacher is usually more knowledgeable about scientific matters than the media specialist. The media specialist, however, brings certain qualifications to his position which enable him or her to converse intelligently with the science teacher and to formulate comments and to pose questions which will be helpful in the selection and utilization of materials. It is not a new concept to involve teachers in the evaluation and selection of materials; this has been encouraged for many years. The media specialist, however, is adding a new dimension to his or her role of coordinator of resources when he or she becomes more aggressive and concerned about the utilization made of media.

A specific example might show how a productive relationship between media specialist and teacher can create such a lively exchange that it is difficult to determine where media services end and teaching strategies begin. Several of the media specialists in my high school have assisted a teacher of environmental science; the teacher has been most generous in relaying appreciation to the media staff, and the media staff benefits from the examples the teacher provides of the creative utilization of materials. Students are given the chance to extract information from media and have been inspired by their contacts with media to create their own materials. From the variety of activities that occur in the environmental science classes, Edward Radatz has related to me his use of films in a unit about water pollution. Each film was produced by a group representing diverse interests in water pollution. The students learned of the viewpoints of these groups through the films. The teacher reported that the films prepared students for discussions and the probing of vested interests, and that the films were also available for review.

*The River Must Live*, a film prepared by the oil industry, is a photographic essay of the causes, effects, and solutions to water pollution.<sup>5</sup> *It's Your Decision—Clean Water* was produced by the Soap and Detergent Association and the League of Women Voters and defines water management problems incurred by increases in population and production.<sup>6</sup> *Threatened Treasures*, produced by a conservation group, portrays sources of water pollution and the effects on fish and people.<sup>7</sup> *The Water Famine*, by the Columbia Broadcasting Company, is a documentary study of worldwide water problems.<sup>8</sup> *The Choice is Ours* outlines some of the needs and problems in the Upper Mississippi River Basin.<sup>9</sup> All of these films are available at no charge from the EPA. Through these films the students were exposed to the points of view of government, industry, and concerned groups. Students were able to make deductions about the worldwide problem of water pollution and were able to find reflections and ramifications of these concerns in national and local problems. Out of this work with commercially prepared films, students were inspired to create their own 8mm film depicting the problems of water pollution in the local area. A recent development growing out of this study in environmental classes is the combining of classes in biology, art, and photography for the purpose of exploring environmental issues.

Another important resource for the media specialist is the student body. Students at the Oak Park and River Forest High School have been influential in bringing environmental studies into the curriculum. My purpose in briefly revealing their activities is to encourage each media specialist to seek the assistance of students and become aware of the possibilities lying dormant in his or her own school. A few students, upon return from a workshop of a state university, requested the opportunity to plan a week-long observance beginning with Earth Day in April 1970.

The impetus for the program and the major responsibilities for the organization of the events fell to the students, who received the support of the administration and faculty. Lectures were scheduled for the week, articles appeared in newspapers, posters and displays were in evidence, and films were made available to classes. As a result of the activities of the week, many students and teachers became aware of the need for environmental education in the school and community. A course entitled Earth Science and provision for discussion of environmental studies within other classes grew out of suggestions made to the board of education concerning the need to develop courses in environmental sciences.

During the summer, a field biology class took trips to nature areas, industrial complexes, municipal sewage plants and other nearby places. A pollution control center was set up in the school by the students. Books, pamphlets, periodicals, and audiovisual materials are available in the center. Citizens of the communities can rely on the telephone service of the center for information about environmental subjects. The students work with local, state, and national groups in gathering and disseminating information. High school students have gone into the elementary schools to help provide environmental courses and special units. The programs for the elementary schools center on basic ecological concepts and guidelines for children to follow both in school and at home in order to increase their environmental awareness. Speakers have been provided for local organizations and to groups outside of the state. A recycling program, a campaign to save the local conservatory, and local clean-up projects have been vigorously pursued by the students. A file of pending legislation on state and federal levels related to the environment is kept at the pollution control center.

The students have concentrated on being informed and informing others, not hesitating to express their views to elected officials and other influential people. They have cooperated with other high schools, organizations, and governmental agencies; delegates and representatives are sent to important meetings concerning state and federal conservation policies. The Presidential Environmental Merit Award was granted in recognition of their leadership. John Rudzinski, student coordinator of the Pollution Control Center, has been most helpful to me in preparing this paper. This student activism has contributed greatly to creating an awareness of the environmental crisis among students, teachers, and members of the community. A more complete report of the activities of these students is available upon request.<sup>10</sup>

What are the implications of this student venture to media specialists in my district or in other schools? The media specialist can survey his situation to see where seeds of interest about environmental studies might be germinating. The media specialist can find ways to be supportive and to promote the interest in environmental studies which students have. An area in the media center might be allocated to students who desire to set up and organize

materials and services about environmental concerns. If interest is developing in another sector of the school, the media specialist should indicate his willingness to help people build collections, find materials, and devise ways of communicating information to all quarters of the school. The media specialist can initiate, draw out, or support an interest in environmental studies among students, and can turn to students for assistance in this endeavor.

Some of the resources needed by teachers and students will not be available in the media center of the school. Frequently it becomes necessary to seek the assistance of other agencies, to cooperate with other libraries, and to turn to other mass media. The media center becomes information central for the client as opposed to a location where materials are housed. The school media center should be a point of access to other resources for students and teachers. The media specialist should know how and where to obtain needed materials easily and efficiently. The responsibility for making connections with other agencies or resources does not end with the identification of the sources of information. The media specialist should follow through on requests to insure that students and teachers can obtain the materials desired with little difficulty. Additionally, the media specialist's knowledge of the resources of other agencies and of the collections in other libraries enables him or her to develop his own collection more effectively, to avoid unnecessary duplication, and to allow other agencies and libraires to use the resources of the school media center. Thus, there is cooperation in utilization and development of collections.

The media specialist has tremendous responsibilities in promoting the effective utilization of materials. His or her role incorporates the challenge of igniting the interest of teachers and students to use a variety of media to meet a quantity of needs. Mention has been made of ways the media specialist responds to requests which come to him and of his or her efforts to alert faculty and students to media which will support existing projects. The media specialist can become the communications pillar through which ideas are exchanged and transmitted. The successful project of one person can be mentioned by the media specialist to others who extract from the project those elements which can be adapted to other enterprises. This exchange has twofold benefits: positive reinforcement concerning his work is given to one person; other people obtain suggestions from which new ideas can be generated.

The ambitious media specialist desires an intense involvement with learning processes and teaching strategies. He possesses an urgency and exudes an aggressiveness which says we have not begun to explore the potential of media for the student. The media specialist must be inspiring to teachers and students and possess a resiliency which enables him or her to accept criticism, apathy, or rejection. Increased, effective utilization of media in schools is

going to be dependent upon his or her initiative and enthusiasm. If this challenge is not accepted, the selection of materials becomes the mundane task of stocking shelves.

## RESOURCES FOR SCHOOLS

I cannot prepare either a definitive bibliography of materials related to environmental studies or a selective bibliography. Furthermore, such lists would not really support some of the points I have attempted to make in this paper. A few materials will be described in this section which might be useful to some schools. The items selected were chosen because they are somewhat representative of the diversity of materials currently on a flooded market. The materials have not been subjected to evaluative criteria. The problem facing the media specialist will be that of selecting from the many materials those which can be utilized in his or her own school. The quality of the materials which one purchases will vary. Some sources mentioned here and many sources not mentioned, can be used to lead the media specialist to materials useful for environmental studies.

The *Index to Ecology*, produced by the National Information Center for Education Media, contains over 7,000 titles of nonbook media including filmstrips, 8mm and 16mm films, records, audio tapes, video tapes, and transparencies.<sup>11</sup> The term ecology is defined broadly and covers topics ranging from automation to habitations to water supply. This compilation of materials is not meant to be evaluative, but is useful as a listing to lead one to the many nonbook materials about ecology which have been produced. Bibliographic information includes the description of the format of the item, year of release, and LC card number. Brief annotations sufficiently describe the items for the purposes of this list. Appropriateness of the materials for age levels from preschool through adult, including professional use, is indicated. The index has further utility, a usefulness not necessarily intended by the producer: for the media specialist in a quandary concerning how to develop definitions of the topic, and how to suggest to teachers ways to let students further investigate environmental studies, a perusal of the subject categories and scanning of the pages of available materials should provide encouragement to those who are unsure about channels through which this topic could be explored.

The AAAS has recently published the third edition of its list of science books for children.<sup>12</sup> In 1970 the third edition of *The AAAS Science Book List* appeared.<sup>13</sup> Science and mathematics books for secondary schools are suggested in this annotated bibliography. Both sources are invaluable for locating books about science for school media centers. The broad scope of science is recognized and titles related to environmental sciences can be found throughout the Dewey classifications used in the list.

The October 1971 issue of *Scholastic Teacher* contains a special feature section entitled, "Teacher's Survival Guide to Environmental Education Resources." The materials included are aimed toward, but not limited to, students in junior and senior high schools. Each entry is annotated and for nonbook materials, sufficient information is given, when appropriate, for ordering, previewing, or renting. There are four parts to this feature section: multi-media, paperbacks, films, and booklets. The materials in each category are selected and reviewed by panels composed of professional educators. For each category criteria for inclusion are supplied. In view of our concern regarding criteria, it seems pertinent to mention some of them briefly. Although some of the statements are reminiscent of conventional criteria, others are, perhaps, a reflection of the times and of the current interest in the topic. The twenty-four entries in the multi-media section include slides, games, filmstrips, and audio recordings which had been rated through a questionnaire in regard to such matters as "content accuracy, attractiveness, and facility of use by teachers and students. Several questions concerned the degree to which materials involved students in making judgments and acting upon their convictions about the environment. A high rating was given to materials which encouraged meaningful student activity."<sup>14</sup> In the paperback section, thirty-nine titles were included which had stood the tests of "content accuracy, readability, and appropriateness for junior-senior high school curricula."<sup>15</sup> The films section lists sixty-four entries including different types of film ranging from animated to quasi-documentary. Among the criteria is one question which incorporates terminology of the day, "Does the film represent both the cognitive and affective aspects of environmental awareness?"<sup>16</sup>

Siehl identified significant contributions to the literature related to the environmental crisis in *Library Journal*<sup>17</sup> and updated his findings in a subsequent issue.<sup>18</sup> Although the articles are not specifically intended for the school audience, the titles mentioned would be useful to senior high school students and elementary school teachers. The suggestions in the earlier article are particularly valuable for picking up older publications which will, perhaps, find a better reception today. Some government publications and scholarly works are cited; titles useful in gathering information for the high school debate topic of 1970-1971 are also mentioned. For younger people an article by Heylman mentions juvenile books about ecology, conservation, and pollution including fiction titles published up to 1970.<sup>19</sup>

Two periodicals which should regularly be checked by the media specialist for articles to suggest to teachers, or for materials to be included in the collections, are *The Science Teacher* and *Science and Children*, both published by National Science Teachers Association. Mention will be made of only a few articles; the media specialist will find many more which could be

helpful. The October 1971 issue of *The Science Teacher* provides an example of the type of assistance one can receive from this journal. An article by Samples describes a project in Boulder, Colorado, which has been funded by the National Science Foundation to focus on self-awareness and the environment.<sup>20</sup> Another article entitled "Environmental Investigations—Getting Help from Uncle Sam" is particularly well-organized and should help the teacher and media specialist to sort out the various governmental agencies which offer publications and conduct activities regarding the environment.<sup>21</sup> Since many departments and bureaus within the departments gather and disseminate information about the present crisis, the listing should be quite valuable. The usefulness of the article will decline with the passage of time because many of the pamphlets and brochures will undoubtedly be superseded or become out-of-print. Another contribution of this issue of *The Science Teacher* is the description of an environmental project for high school students entitled, "Survival City," for which students were challenged to design and construct a habitat in which man can survive as a species.<sup>22</sup> A recent issue of *The Science Teacher* continues to carry articles useful to environmental studies in schools. The October 1972 issue includes an article about water management,<sup>23</sup> a report of a high school project,<sup>24</sup> a survey of the current status of environmental education,<sup>25</sup> and description of a pollution game.<sup>26</sup> Books and audio-visual aids are also reviewed.

The *American Biology Teacher* usually carries articles of significance to environmental studies. A recent issue reported a project developed for biology teachers<sup>27</sup> and a study at Purdue University concerning water in the city ecosystem.<sup>28</sup>

*Media and Methods* is enthusiastically used by a number of English teachers. Its scope and appeal, however, enable it to enjoy a much larger audience. The media specialist can find ways to incorporate environmental studies into the program of the English department. The article "We Are What We Throw Away," concludes with seven "eco-books" of interest to the English Teacher.<sup>29</sup> Schrank, in his list of materials, grouped films into two sections.<sup>30</sup> One section contained the films he considered to be most creative and most significant for use in the high school; the other section listed films of value which are primarily useful as information providers. Paperbacks, periodicals, films, filmstrips, transparencies, and posters are suggested by Schrank, but his list of musical recordings about ecology adds a new dimension to the media collection. Damio's "Ecology Bookology" is a spritely list of paperbacks which by now are probably in most high school collections.<sup>31</sup> Four stars are awarded to a title which is "as lovely as a tree." Books about air pollution are mentioned under "Save Your Breath: I Shot an Arrow into the Air and It Stuck."

Periodicals which have devoted several articles or feature sections of certain issues to environmental studies include:

*Childhood Education*, January 1971

*Compact*, June 1971

*Educational Product Report*, March/April 1971

*Grade Teacher*, October 1970

*Instructor*, January 1971

*Paperbound Books in Print*, March 1970

*Social Education*, January 1971

*Today's Education*, December 1970

This list is far from comprehensive, but is indicative of the breadth of interest in the topic particularly in journals other than those of science education.

Mention of a few articles must suffice to show how the study of the environment has infiltrated many areas of the curriculum. The diversity of the articles can be illustrated by citing two articles. Chambers and VanAssen suggest the study of ecology through children's literature,<sup>32</sup> and Figurski encourages teachers of industrial arts to assume key roles in the interdisciplinary ventures currently developing.<sup>33</sup> The list of materials in the latter article is particularly useful for the references to resources available from industry.

Articles concerning environmental education have appeared in many journals of the education profession. There are probably only a handful of periodicals which have remained immune to some aspect of environmental studies. *Education Index* and *Current Index to Journals in Education* should be checked to locate references about the environment. Informative articles, lists of resources, bibliographies, and reports of action projects are to be found in the literature of the profession.

Some magazines which can be counted on to carry news about the environment and, therefore, should be checked regularly are: *Audubon*, *Conservationist*, *Environment*, *National Parks & Conservation Magazine*, *National Wildlife*, *Natural History*, *Parks & Recreation*, *Science*, and *Science News*. Titles of magazines which feature or tend to include information about the environment can be located in the standard sources which classify periodicals by subject areas.

To stress the diversity of materials available, I will enumerate five important sources:

1. *Selected U.S. Government Publications*, issued twice monthly by the Superintendent of Documents, provides the least painful way to keep up with the many publications of the government useful to schools. A recent issue announced the new conservation yearbook and listed several previous yearbooks.
2. The Center for Cassette Studies, Inc., offers audio recordings of speeches and discussions regarding the environment.<sup>34</sup>

3. R. R. Bowker Co. is attempting to provide sorely needed reviews of nonprint media in *Library Journal/School Library Journal Previews*.
4. ERIC Information Analysis Center for Science and Mathematics Education has undergone a comprehensive acquisitions and dissemination program under the direction of a special coordinator for environmental education.
5. The sound-slide program entitled *Man and His Environment* reminds us that there is an approach to environmental studies through the humanities.<sup>35</sup>

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## Selecting and Evaluating Environmental Information Resources in Public Libraries

The Chicago Public Library's interest in the environmental sciences dates from March 1971 when it was announced that Montgomery Ward and Company was giving the library \$25,000 to establish a special environmental sciences collection. This collection is to serve as a memorial to Aaron Montgomery Ward who played an instrumental role in the early efforts leading to the preservation of Chicago's lakefront. Chicago thus became the third large public library to formally establish a special collection dealing with the environmental sciences. Previously, the Denver and Minneapolis public libraries had embarked upon programs to develop special environment collections emphasizing, respectively, wildlife and conservation. In order to avoid duplicating the efforts of the Denver and Minneapolis libraries, the Chicago Public Library has chosen to concentrate on five specific areas of the environmental sciences: ecology; environmental health; the legal aspects of environmental problems; the causes, effects, and control of pollution; and problems of the urban environment. The Ward funds are being received at the rate of \$5,000 per year over a five-year period and are being supplemented as far as possible by regular library funds. Although all of the material obtained so far for this collection has been printed, it is expected that audiovisual and other nonprint materials will eventually be included and play an important role in providing environmental information to the users of the Chicago Public Library. The reading levels provided by this collection range from introductory works for the beginning student and layman to advanced treatises for researchers with a special knowledge of and interest in the environmental sciences.

In attempting to cope with environmental information resources, librarians are faced with five basic problems: (1) the large amount of material

being produced; (2) the wide range of subjects covered by the literature; (3) the wide variety of material format; (4) the wide range of reader levels requesting the material; and (5) the frequently great expense of the material. Concerning expense, it need only be said that few libraries can even attempt to obtain everything being published in the environmental sciences. The Chicago Public Library is certainly not one of these; however, it is attempting to develop a strong environmental sciences collection emphasizing the subjects previously mentioned, and this material is available to other public libraries throughout Illinois through interlibrary loan.

No librarian should be surprised to hear that the amount of material being published in the environmental sciences has increased tremendously over the past several years. In order to gain a better perspective of this increase, two common bibliographic sources, the *Subject Guide to Books in Print* and the *Monthly Catalog of United States Government Publications*, were checked to determine the number of entries appearing under the headings of ecology, environment, pollution, and wildlife conservation during the period of 1962 to 1971. Fig. 1 shows the appropriate data for the *Subject Guide to Books in Print*.<sup>1</sup> The subject headings of ecology and pollution showed the greatest increase with the former climbing steadily from 32 entries in 1962 to 119 in 1971, and the latter climbing from 4 entries in 1967 to 81 in 1971. There were no subject headings for pollution before 1967. The number of publications concerned with wildlife conservation also increased significantly during the ten-year period but at a more gradual rate than ecology and pollution. This can undoubtedly be explained by the fact that concern with wildlife conservation did not just begin in the past few years but has been a matter of interest for many years. No entries appeared under the heading of environment until 1971, and this is probably indicative of the fact that the term environment has only recently come to have, for many people, a much more restricted meaning.

Beginning in 1967, the *Monthly Catalog of United States Government Publications*, as shown in fig. 2, showed a remarkable increase in the number of publications indexed under environment.<sup>2</sup> Prior to that year the term, as used by the Superintendent of Documents, had a much more restricted meaning such as spaceship and spacesuit environments. Entries under the headings of ecology and wildlife (the term wildlife conservation does not appear in the index) showed no dramatic increases but remained fairly constant. There were no entries under the heading of pollution until 1971, but forty-two entries appeared in that year. Prior to 1971 the term pollution was used only as a subheading under such subjects as air and water.

It will be useful to discuss some of the sources a librarian can use to learn of the availability and publication of environmental information material and what he can use as evaluation aids. What are the material selection aids

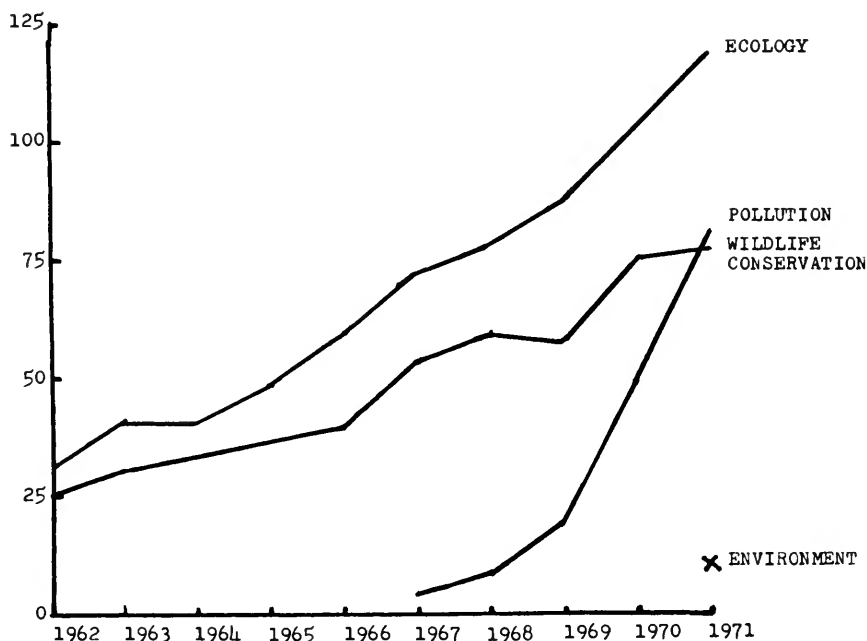


Figure 1. Number of entries in the *Subject Guide to Books in Print* for Four subjects During the Period 1962 to 1971

that list and describe environmental information resources? To answer this question a check was made of 356 order slips filed in the "books received file" of one department in the Chicago Public Library. Whenever a book is ordered for this library a 3 by 5 order slip is prepared listing the author, title, publisher, date, price, and the source of information. After the book has been received and processed the order slip is retained in the "books received file" for future reference. Thus, it was possible to check these to determine the sources of information for 356 titles received in the Ward Collection as of July 22, 1972.

The information obtained in this check is summarized in table 1. The results are surprising because *Books in Print* was given as the source of information for 94 percent of the 356 titles. The other sources given were the *AAAS Science Book List*, approvals from book jobbers, the journal *Ecology*, *Library Journal*, publisher's catalogs or announcements, and *Publishers' Weekly*. It is undoubtedly safe to assume that *Books in Print* can be interpreted to mean the *Subject Guide to Books in Print*. There is a logical explanation for the preference given to this selection tool. Because the order that brought the titles in question to the library had to be prepared in a very short period of time, the fastest possible way of finding appropriate titles was

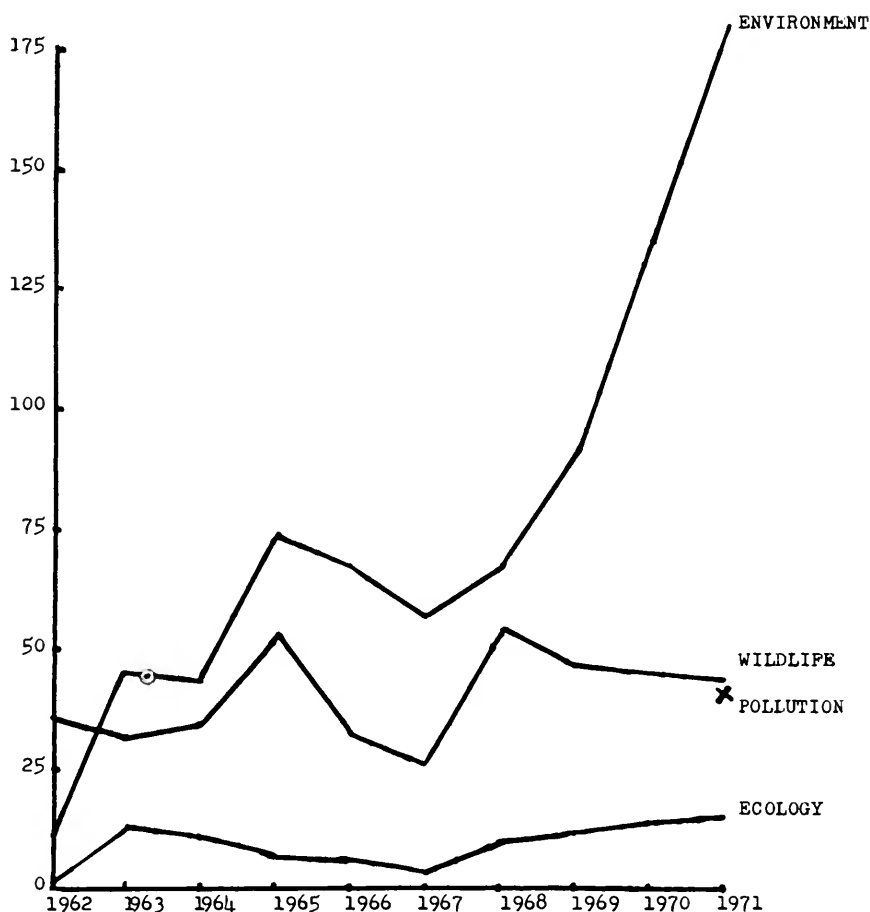


Figure 2. Number of Entries In the *Monthly Catalog of United States Government Publications* for Four Subjects During the Period 1962 to 1971

simply to make photocopies of the pertinent sections in the *Subject Guide to Books in Print*. These were then used as checklists to compare with the library's holdings. This procedure can be recommended as a good first step for any public library beginning to develop a collection of environmental information resources.

Another check similar to the one just described was made of a second group of titles—186 titles ordered by one department on March 27, 1972. This time the number of sources used increased to 142 with the following publications being added: *Bioscience*, *Choice*, *Ecology Today*, *Natural History*,

Source	Number of Citations
<i>AAAS Science Book List</i>	1
Approval copy	3
<i>Books in Print</i>	334 (94%)
<i>Ecology</i>	13
<i>Library Journal</i>	1
Publisher's catalog or announcement	3
<i>Publishers' Weekly</i>	1
Total	356

**Table 1. Sources Cited for 356 Ward Collection  
Titles Added  
as of July 22, 1972**

Source	Number of Citations	Percentage
Approval copy	11	5.8
<i>Bioscience</i>	2	1.1
<i>Books in Print</i>	20	10.8
<i>Choice</i>	8	4.2
<i>Ecology</i>	5	2.6
<i>Ecology Today</i>	2	1.1
<i>Library Journal</i>	8	4.2
<i>Natural History</i>	1	0.5
<i>New York Times Book Review</i>	1	0.5
Publisher's catalog or announcement	26	14.1
<i>Publishers' Trade List Annual</i>	22	11.8
<i>Publishers' Weekly</i>	61	33.1
<i>Science</i>	16	8.6
<i>Science News</i>	3	1.6
Total	186	100.0

**Table 2. Sources Cited for 186 Ward Collection  
Titles Ordered March 27, 1972**

the *New York Times Book Review*, *Publishers' Trade List Annual*, *Science*, and *Science News*. As shown in table 2, the major source of information was *Publishers' Weekly* which was used for 61 titles. *Books in Print*, publisher's catalogs or announcements, *Publishers' Trade List Annual*, and the journal *Science*, were grouped together next. Most of these titles will be familiar to librarians, and together they represent a good, although certainly not exhaustive, source of information on material being published in the environmental sciences.

Of the 13 titles listed in the two tables it is very likely that *Books in Print*, *Library Journal*, *Natural History*, *Publishers' Weekly*, *Science News*, and,

perhaps, the *New York Times Book Review* would be received by small public libraries, and these publications provided information on 430 titles out of the total of 540 involved in the check of sources. Medium-sized public libraries could be expected to receive, in addition to the latter group, *Bioscience*, *Choice*, *Publishers' Trade List Annual*, and *Science* which together yielded information on another 48 titles. In selecting material librarians prefer, of course, to base their decisions on reviews or personal examination of the material, but unfortunately, this is usually not possible. Of the 540 titles checked, only 14 were selected on the basis of an examination of an approval copy. Of the remainder, it is impossible to state how many reviews were available, but it is unlikely that more than a small fraction of them were selected on the basis of reviews. Most of the sources discussed publish reviews; however, even these reviews are representative of only a small portion of the total number of titles announced.

How, then, does one select a title when a review or approval copy is not available? This can best be answered by analyzing the data given in the announcements contained in the weekly record of *Publishers' Weekly*, the major source listed in table 2. *Publishers' Weekly* usually includes the following bibliographical data in announcing new titles: author, title, publisher, imprint, complete collation, Dewey and LC classification numbers, price, LC card number, and LC subject headings. Almost all of these items can be useful in selecting a work. Quite often the author will be recognized as being an important contributor to the literature of the environmental sciences. Ordinarily it will not be wise to rely on the title of a work as an indicator of the work's usefulness. It should generally be considered in combination with the author and the publisher. There are many well-known publishers producing environmental literature of high quality, but there are also some that must be regarded with suspicion, e.g., the vanity presses. A very useful indicator of a work's potential value is the collation. This will give the pagination of the work, in itself an important bit of information, and indications of illustrations, maps, and the size. The Dewey and LC classification numbers help to pinpoint the location of the work in the collection if it is selected. This is helpful because it may be that the collection is already strong in that particular area and there are other areas of greater priority. The LC subject headings are similarly useful. It is clear, then, that even with a minimum of bibliographical data it is possible to select intelligently.

Thus far this discussion of the selection and evaluation of environmental information resources has been limited to books. It is obvious to anyone dealing with environmental information resources that books represent only one of many forms of recording environmental information. Government documents, pamphlets and other vertical file material, periodicals, and audio-visual and other nonprint material are all important sources of information in

this field. Because at least one of the articles of this volume will be devoted to audiovisual materials, nothing will be said here concerning the selection and evaluation of this type of resource. However, it should be emphasized that audiovisual materials, because of their unique property of imparting ideas and concepts to groups of people as well as individuals, represent a major potential source of environmental information for public libraries.

In developing a collection of environmental information resources, government documents must be given some priority. This is true for federal, state, and local documents because these publications quite often are the only sources of information that deal with specific geographical areas and environmental problems. Also, some government documents are available at little or no cost and are, therefore, easily obtainable by any public library. On the other hand, because of the large output of government publications dealing with the environmental sciences, it will be difficult for most libraries to even attempt to develop comprehensive collections of this material. The solution to this problem is provided by depository libraries. The Chicago Public Library is a depository of federal and Illinois state documents, and these are available for loan to other public libraries in the state. Nevertheless, smaller libraries must be aware of the publication of specific documents, and this is best done through a subscription to the *Monthly Catalog of United States Government Publications* and LC's *Monthly Checklist of State Publications*. Even if no documents are purchased, these publications will give librarians and library users an idea of what might be available from a depository library. The LC state documents checklist is recommended even for small public libraries because it is the only source of reasonably up-to-date information about publications of all the states that may be of local interest and importance. With the exception of this one source, state documents are generally not very well controlled.

The problem of control is especially difficult for local documents below the state level. Some municipal public libraries and archives issue periodic checklists of city and, sometimes, county documents. Otherwise, the only way that librarians can find out about these publications is to become familiar with the local agencies that are concerned with environmental problems and request that the library be provided with copies of their publications or the necessary information for obtaining them.

Another potentially valuable source of environmental information is the pamphlet. Many government documents appear in this form; therefore, the *Monthly Catalog* and the LC state documents checklist will be helpful in locating material for the pamphlet file. Pamphlets often contain information that is not available elsewhere. Examples are reports of the activities of private environmental groups and policy statements of industries that are being accused of polluting the environment. In addition pamphlets are frequently

available at little or no cost if one knows where to get them. Two sources, the *Monthly Catalog* and the *LC Monthly Checklist of State Documents*, have already been mentioned, but the best known source of information on pamphlets is H.W. Wilson and Company's *Vertical File Index*.

The most up-to-date information about environmental problems is found in periodical literature. The selection of a particular periodical usually depends on whether or not it is indexed. There are many general and specialized indexes to periodical literature, and the best known of these, *Readers' Guide to Periodical Literature*, indexes dozens of general interest magazines that regularly report on important developments in the environmental sciences. This index, furthermore, covers several magazines that are primarily concerned with problems of the environment: *Audubon Magazine*, *Conservationist*, *Environment*, *Living Wilderness*, *National Parks & Conservation*, and *National Wildlife*. Most small public libraries receive *Readers' Guide to Periodical Literature*. Larger libraries might receive, in addition, the *Social Sciences and Humanities Index*, the *Business Periodicals Index*, and perhaps the *Applied Science and Technology* and *Biological and Agricultural* indexes, all of which index material of a more technical nature than *Readers' Guide to Periodical Literature*. Only the largest public libraries will receive such specialized indexing and abstracting services as *Biological Abstracts*, *Chemical Abstracts*, *Pollution Abstracts*, and *Water Pollution Abstracts*, but it is unlikely that more than a small percentage of the journals covered by these abstracting services would be received by a public library. For the highly specialized material of the environmental sciences it is necessary that public libraries of all sizes take advantage of interlibrary loan services and be aware of local special collections that may be available to the general public.

It is not always possible to find timely reviews for most new books. Often selection of a particular work must be based on nothing more than a brief description of the work such as can be found in the weekly record of *Publishers' Weekly*. Reviews can be found in many publications such as *Choice*, *Library Journal*, *Publishers' Weekly*, and *Science*, but even these do not always give a librarian a good idea of the potential value that a work may have in a particular collection. Ideally a librarian would be able to base his decision on whether to purchase a particular work on a personal review of a copy of the work. What, then, are the criteria that must be considered by a librarian in evaluating an approval copy of a work dealing with the environmental sciences?

It is really not necessary to set up any special criteria for evaluating environmental information material. There are many special contemporary problems that public librarians have to be concerned with in developing library collections, and in most libraries the material dealing with the environmental sciences can receive no more special consideration than that dealing

with drug problems, race relations, poverty, and other important issues. It is obvious then that in most cases a library's normal standards for selection and evaluation will be applied to environmental information resources. The *Materials Selection Policy* of the Chicago Public Library offers the following general criteria for selection:

A new acquisition must be measured against other materials available to determine what purchase seems wisest in view of the Library's needs and the funds available. The selector takes into account such standards of selection as content, style, authority, format, and effective presentation. In each instance the selector must critically appraise the work, noting how well the idea is communicated to the recipient and how the material adds breadth and depth to the collection already at hand. The overall value of the material is the chief criterion of selection.<sup>3</sup>

These are valuable guidelines that can certainly be applied to the selection and evaluation of environmental information material; however, two points need to be elaborated. First, who will be the recipient of the material? Public libraries are expected to serve all reader levels. Although much of the material being published in the environmental sciences is technical in nature, there is also a substantial amount of literature in this field that is aimed at beginning and intermediate students and laymen. Small and medium-sized public libraries will normally be most concerned with this group. Large public libraries can expect to serve this group and, in addition, more specialized users such as businessmen, lawyers, advanced students, government officials and scientists. Thus, in developing an environmental collection each library will have to carefully define the collection's potential users.

Another point stressed in the Chicago Public Library's general selection criteria is the importance of a new acquisition adding breadth and depth to the collection. An interesting aspect of the environmental crisis and its literature is its pervasiveness. This is an important point to remember when considering ways in which the breadth and depth of a collection can be improved. In a given library the environmental information material may be primarily concentrated in one subject area or department, but it is equally likely that related material will be found throughout the collection. Thus, while the bulk of material may be found in the natural sciences, it can be expected that important additional material will be found in the technology section, the social sciences and legal section, the medical section, the business section, and even, in some instances, the humanities. Therefore, a library, by developing an environmental collection, will be contributing to the strength of the overall collection in many seemingly unrelated areas.

A final factor to consider in the selection and evaluation of environmental information resources in public libraries is that of priority. Considering the fact that public libraries constantly receive requests for more material and information in many different areas, how much priority can a library give to the development of a collection of environmental information resources? This

question needs to be preceded by an even more basic one: Is there really an environmental crisis? Few people today would say that there are no environmental problems or that those that do exist are of no consequence. In fact, the environmental crisis has now been taken up as an important issue by all segments of our population, and it seems that at least in the United States there is virtually unanimous agreement that humanity is faced with very serious environmental problems that will have to be solved.

It is absolutely necessary then that public libraries gather, organize, and provide for their patrons the information necessary for the development of an understanding of environmental problems. Since most public libraries will have to weigh their needs for environmental information material against their needs for material in many other subjects, this discussion has concentrated on the usefulness of basic material selection aids in providing information about available resources. Utilization of these basic selection aids will provide most public librarians with enough information to develop a well-rounded general collection of material that will fulfill the needs of most patrons. More advanced and specialized material will, hopefully, be available to public libraries in the state of Illinois from the four state reference and research centers. As one of these centers, the Chicago Public Library looks forward to playing an important role in helping the citizens of Illinois develop a greater environmental awareness.

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## Coping with Environmental Information Resources

At a meeting on environmental literature held in Cincinnati in September 1972, it was reported that seventy-five government agencies put out reports in the environmental area. I knew I had trouble locating material. This figure gave me an idea why. There is no lack of literature available. The problem comes in trying to cope with it.

### Nature of the Field

Coping is the problem in many subject areas. There are three factors that make it particularly difficult to cope with environmental literature because of the nature of the field itself. First, environmental sciences is a new field; its boundaries are not yet clearly defined. It was only in 1965 that the heading "Man-Influence on Nature" appeared in *Readers' Guide*.<sup>1</sup> Before that, the emphasis had been on the influence of the environment on man, not the other way around. It was not until December 1970, that the Environmental Protection Agency was established to centralize in one agency the major federal pollution control programs formerly scattered in different departments.

Scattering is the problem with the literature also. There are no comprehensive bibliographies of books, periodicals, reports, microforms, or audiovisual material. There are numerous partial bibliographies which must be located one by one. The need for coordination and cooperation in literature identification and exchange was one of the concerns of the United Nation's first Conference on the Human Environment, held in Stockholm in June 1972, and one of the concerns of the EPA's first National Environmental Information Symposium, held in Cincinnati in September 1972. The "first" in the titles of both conferences also points up the recency of concern in this area.

A second factor which makes it difficult to cope with environmental literature is that the field is broadly interdisciplinary. I have worked with

scientific and technical literature for a number of years and am somewhat familiar with the traditional disciplines. My present position includes working with a project group studying phosphate pollution control in Lake Erie. This group includes biologists, chemists, geologists, toxicologists, systems analysts, engineers of all kinds, economists, political scientists, mathematicians, logicians, and a philosopher, whom I assume will either gather all the strings together at the end, or ease the process of such diverse disciplines communicating with each other as the work progresses.

To back up the information requests of such a diverse group requires the availability of major information sources in each subject area. This is true for students in the new environmental sciences departments and divisions, as well as the burgeoning citizen action groups. The nature of the environmental science field is broad and cuts across traditional disciplines, requiring a reorganization of the fields of information, at least in the librarian's mind, and preferably in the more permanent form of catalogs, indexes, bibliographies and cross references.

The third factor which makes environmental literature difficult to cope with is the rapid growth of the field resulting from the rapid growth of interest in this area by the public and the government. A survey of entries in the *Congressional Record* for a period of several months in 1969 showed the environment to be second only to Viet Nam in number of occurrences. Public interest burgeoned in the sixties.<sup>2</sup> *Ulrich's International Periodicals Directory* caught up with this stream of interest by using, for the first time in the 1967 edition, the combined heading "Air and Water Pollution" under which were listed thirteen periodicals.<sup>3</sup> The 1971 edition listed 120 periodicals under the heading "Environmental Science."<sup>4</sup>

The growing public interest and outcry helped focus government attention on the environmental area. With government attention comes government funding, which is a tremendous aid to growth. EPA, which was only established in December 1970, now funds, or partially funds, 4,000 projects. I am sure some were taken over from earlier agencies, but I cannot help assume this represents a growth in the number of studies in the environmental area. I know of three such studies begun at Case Western Reserve University within the last two years, and I believe this is being replicated at campuses across the country. This tremendous growth has resulted in a lag between the literature which is being produced and used in the environmental sciences and the sources which would organize, coordinate, and make it possible to locate information sources in this area.

### How to Cope

Having decided that the literature of the environmental sciences is difficult to cope with, it now becomes necessary to figure out ways to cope in spite of these difficulties.

### DEFINE GOALS

The first step, as usual, is to define, as specifically as possible, the purposes of the collection. University Libraries at Case Western Reserve University wanted to concentrate on covering the entire field of the environmental sciences in its scientific and technical aspects; on gathering academic material of general interest on appropriate levels for the undergraduate, graduate student and faculty member; on backing up the courses which the university offers; on including local material; and on covering historical as well as recent developments.

Once goals have been defined and criteria is available for judging the usefulness of a particular item and where it will fit in, a library is ready to look at what it has and see what needs to be acquired.

### MINING THE COLLECTION

A general library will already include an environmental literature collection scattered throughout it. The first step, then, is to find out what is already held in the environmental area. This is done by studying the subject headings, checking the government documents collection, reading the periodicals list, and examining the microforms and the audiovisual material.

We are trying to set up a central catalog, or data base, of what we have available in our collection, in any form, and we hope to expand this to include material in other local institutions, since the central problem is not the physical location of the material, but is, rather, the organization of a means of finding information in this area. And before selecting and acquiring more, one needs to know what one already has.

### HOLDINGS CHECKLISTS

Having determined a library's holdings, one is now ready for a standard list against which to check the holdings, but I have not been able to find any. Useful for this purpose, however, are the three bibliographies distributed at the Special Libraries Association Conference in Boston in June 1972, which were prepared for the seminar entitled "The Environmental and Ecological Literature—Where Does it All Come From?" One of these, which covers all types of publications, is now available for purchase from the Special Libraries Association in New York under the title "Environmental Information Sources, Engineering and Industrial Applications, A Selected Annotated Bibliography."<sup>5</sup> The second of these bibliographies is called "Environmental Services"<sup>6</sup> and includes abstract and indexing journals. The third, entitled "Environmental Legal Problems"<sup>7</sup> covers available legal sources.

In addition to these, three EPA publications might be useful as checklists. The EPA list of journal holdings is published yearly. Lists of their book holdings and technical report holdings are scheduled for publication in the near future.<sup>8</sup>

Another useful list is found in the back of the first yearly issue of *Pollution Abstracts*<sup>9</sup> published in La Jolla, California. This includes three master lists: one on serial publications, one on special publications (conference proceedings, symposia, etc.) and one on books. These may provide some help in pointing out where a collection is strong and where it is weak.

### Types of Material

After finding out what is held, a librarian is now ready to select more. First, let me stress the importance of using all of the selection tools which are generally used for selecting material in other subject areas, as well as those tools used generally for selecting scientific and technical publications. These will contain listings of environmental literature and are invaluable aids.

Before starting to select, a librarian might want to read an article which gives a brief background of conservation in this country, as well as mentioning key publications. That is "Our World—and Welcome to It!" by George H. Siehl, which appeared in the *Library Journal* in April 1970.<sup>2</sup> More background reading would be "Environmental Science for Undergraduates" by Thomas Kirk, which appeared in *Choice*, in January 1971.<sup>10</sup> This article briefly discusses the field of environmental literature, and is a bibliography of the most important books, periodicals, and reports for a collection in this area.

The four types of materials needed in an environmental literature collection are, as usual, books, periodicals, reports and audiovisual material. Each type requires a slightly different approach, as they do in any subject area.

### BOOKS

I would like to discuss books first. A good place to start in book selection would be to read "Geotechnics" by William Niering, which appeared in *Choice* in January 1970<sup>11</sup> and is a discussion of books in this area. Another is the critical review article entitled "Ecology Books in the 70s," which appeared in the October 1972 issue of *Choice*<sup>12</sup> and concentrated on recent books. These will suggest a core on which to build.

Basically, in selecting books, one will want to use all the regular sources generally used for selecting books in science and technology. They all include sections on this new science.

There are publishers who deal specifically in this area. Environmental Science Services, a division of Environmental Research and Applications in New York, is one such publisher. Another is the Environment Information Center, also in New York, which publishes *Environment Information ACCESS*,<sup>13</sup> an abstracting journal, and the *Environment Index*,<sup>14</sup> a cumulative citation index, discussed in the paper by Kollegger in this volume. It is a good

idea to look through publishers' announcements to keep aware of the new publishers who specialize in the environmental area.

However, selecting books in this subject field is basically no different than in any other field. The standard publishers cover the area well, their publications are picked up in the usual library selecting sources, and book reviews may be found in these, as well as in environmental periodicals. A judgment on quality might be helped by checking the individual title against the standard lists mentioned earlier, in connection with checking the holdings already in the library.

### AUDIOVISUAL

A lot of audiovisual material is being put out in the environmental area. Much of it comes from the educational film bureaus, for use in new courses on the environment. These will be listed in those catalogs which are generally used to select educational films. I do not select films, but I collected catalogs from five firms who produce films on the environment when I attended the National Environmental Information Symposium. I am sure many more film producers will begin to take an interest in this area. University audiovisual centers, such as the one at Indiana University, are another good source of films. The EPA has films available for purchase or loan.

I recently saw an announcement from the AAAS of audiotapes of twelve of their scientific symposia related to the environment. Storer Broadcasting, Radio Division, Cleveland, Ohio, has available a composite tape of eighteen video mini-programs on ecology. I do not know the quality of these programs but have become aware of their existence by scanning the current awareness periodicals in the environmental area—the only way I know of to keep up with what is being produced. An aid to selecting films is the *Environment Film Review*,<sup>15</sup> an annual critical guide to 600 environmental films available from the Environment Information Center in New York.

### REPORTS

I consider reports the major source of information in the environmental area, and one frequently not well represented, organized, or used in university libraries.

To start at the top, with worldwide or foreign reports, the major reports are picked up in the abstracting journals, and scanning these as they are received will probably give adequate coverage for other than specialists.

The major producer of reports useful in university collections is the U.S. government. I mentioned earlier that seventy-five government agencies issue reports in the environmental area, so there is no substitute for scanning the *Monthly Catalog of United States Government Publications*.<sup>16</sup> More specialized is the semimonthly publication, *Environmental Awareness Reading*

List,<sup>17</sup> available from NTIS. This is a bibliography resulting from the regular review by the Department of the Interior of about fifty publications. Also available from NTIS is a weekly bibliography entitled *Environmental Pollution and Control*.<sup>18</sup> And the Superintendent of Documents produces *Price Lists of Government Publications #88, Ecology*.<sup>19</sup>

A good recent specialized bibliography to use as a checklist is *Our Polluted Planet: A Bibliography of Government Publications on Pollution and the Environment*,<sup>20</sup> published in 1971 by Western Washington State College, Bellingham, Washington.

It may help to keep in mind that there are three main U.S. government agencies responsible for the environmental area. One is the National Oceanographic and Atmospheric Administration which, along with the U.S. Geological Survey, is responsible for compiling basic data about the environment. The President's Council on Environmental Quality is the second major agency in this area, and is concerned with advising the president on policy, telling him what the public wants. And last, the primary agency, and main publisher is the EPA which, through its Office of Public Affairs, its libraries, and its information centers is set up to aid in disseminating environmental information. Being familiar with what these three main agencies are doing, collecting, and publishing will keep you aware of what information is available nationally in the environmental sciences.

A means of keeping up with what they are doing is to scan the *Environment Reporter*,<sup>21</sup> a loose-leaf service published by the Bureau of National Affairs in Washington, D.C. This is divided into eight sections covering federal and state laws and includes a section on current developments. It covers the topic of the government and what it is doing to and for the environment quite thoroughly. The U.S. government is the source of a vast number of up-to-date, inexpensive publications at all levels of generality or technicality, and these publications should be well represented in any collection of environmental literature.

The U.S. government reports will be of general interest. Other organizations serve more specific needs. Area organizations, i.e., those concerned with the Great Lakes, are of special interest; state, county, and city agencies, and private organizations such as the Sierra Club, are good sources of publications to fit particular interests. Bear in mind that those who are interested in environmental literature are generally action-oriented. They want to know what has been done, what is being done, and what might be done; any collection serving them must include reports on what organizations in the environmental area are doing.

A good directory of the reports of these organizations is the 1972 *Directory of Environmental Information Sources*,<sup>22</sup> published by the National Foundation for Environmental Controls. This directory organizes the data

collected by 3,700 environmentally oriented government agencies, legislative committees, citizens groups, professional and trade organizations, and educational institutions.

### PERIODICALS

The third main type of material is periodicals, and they are proliferating at a very fast rate. There are a number of ways to select them. The checklists mentioned earlier give a guide against which to measure holdings. A recent publication, *Environmental Periodicals, Indexed Article Titles*,<sup>23</sup> from the Environmental Studies Institute of the International Academy at Santa Barbara, reproduces contents pages of 300 domestic and foreign journals in the area of environmental studies. This could also serve as a checklist. A tried and true method for selecting periodicals is to see what journals are indexed in the abstracting services. In this case, *Pollution Abstracts*,<sup>9</sup> is a good general source.

### CORE JOURNALS

A fourth method is to try to establish which are the core journals in the subject area. Much research is being done on this method in various subject areas at the School of Library Science at Case Western Reserve University. I used this method in a subject area which was of particular concern to the groups studying Lake Erie, and will describe it.

The subject was eutrophication, which is the aging of lakes. This a natural process but has been greatly accelerated by the pollutants man has introduced into the water. All the groups which are studying Lake Erie are studying its eutrophication. Therefore, the Lake Erie Study Collection needed to contain the journals in this subject field. The groups are interdisciplinary, and so is the subject area, so there was no traditional way of establishing the major journals covering this area. However, we subscribe to *Eutrophication; A Bimonthly Summary of Current Literature*,<sup>24</sup> which is an abstracting journal published by the University of Wisconsin's Water Resources Center Eutrophication Program.

To find the core journals, I counted the number of times each journal was mentioned by determining how many articles in *Eutrophication* abstracts came from each journal. I used the period January through December 1971, since this is a small abstracting journal; a single issue of a more substantial journal might be sufficient. Then I listed the journals in order of the number of articles which had been abstracted, from the largest number to the smallest. I totaled the column listing the number of articles and could then find the percentage of articles, from the entire subject area, which were contained in each journal title. A few journals contained a great many articles, then there was a drop to a less productive group of journals. By calculating what

percentage of articles in a subject area are contained in which journals, and listing the cost of the journals, it is easy to figure out what budget will get you what proportion of articles in a subject area.

I did not include cost but one can get an idea of the efficiency of this method from the following figures. Ninety-nine journals were mentioned in *Eutrophication* abstracts in 1971. Three of these journals contained a quarter of the articles listed. These are the three main journals in the area of eutrophication. Thirty-six of the ninety-nine journals, or considerably less than half, contain seventy-five percent of the articles abstracted. The remaining journals contain, for the year, one article on eutrophication, each, and are distinctly peripheral to the subject area.

The method outlined above could provide a measure of how effectively a periodical collection covered a subject area and would delineate the exact requirements and cost of expanding it to cover new subject areas. These figures, with percentages and costs, would be meaningful to anyone at any level of the administration and could provide a more objective picture of value received, for money spent, than is sometimes available in library purchasing and collection development.

The above covers my topic as well as I am able to from my limited experience, over the last nine months, of working to build a collection of environmental literature. I feel rather like the man in India, about whom Ranganathan wrote, who, when asked to be on a local library board, said, "I offered to go into the Book-Selection Sub-Committee because I have not read many books. I can, therefore, be impartial in selecting books for the library."<sup>25</sup> If we can take this attitude into selecting environmental literature, maybe our ignorance will not hold us back, and we can learn by doing.

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## Durkheim and Weber in Wonderland; Or, Building Environmental Collections for the Real World

Several months after I had agreed, out of sheer vanity, to appear at this Institute on information resources in the environmental sciences, I realized that I would have to say something; not only would I have to appear, but I would have to make some contribution to the development of the theme. Indeed, the more I reflected on my contribution, the more I felt like Alice confronted by the King.

"What do you know about this business?" the King said to Alice.

"Nothing," said Alice.

"Nothing whatever?" persisted the King.

"Nothing whatever," said Alice.

Now it is apparent that "nothing whatever" is not a particularly useful contribution to any discussion, and perhaps I should have given it all up at that point. But again egoism, and a certain sense of responsibility to all those librarians who staff academic libraries throughout the country and who try to serve the general needs of their students, gripped me. Surely if we are doing anything worthwhile when we build our collections, it should be possible to verbalize it, and perhaps a reiteration of those concerns toward which we direct our efforts is always necessary.

As academic librarians we do not need to be reminded that we are engaged in an educational task—that we are indeed the custodians of a central agency in providing our students with a higher education. But, perhaps we sometimes take too narrow a view of what education is and what our role in the process can be. It is one thing to look at the statements of college catalogs with their sometimes too glib, and almost always unread proclamations of what is being attempted; it is quite another to attempt an analysis of the function of education in our society. It is relatively common-

place to view the function of education in terms of curriculum, to speak of teaching mathematics, or English, or history as the function of education. Sometimes, we state our educational task in more cognitive terms, as instruction to develop clear thinking, or to learn ways to systematize data and reach conclusions which are justified in terms of that data.

But we must turn to the sociologists if we wish to inquire into the social function of education, and we may as well go directly to the source. It is interesting to note that those two great founders of modern sociology, Emile Durkheim in France and Max Weber in Germany, though they both viewed education as a vital instrument in society, emphasized functions which are at times in direct opposition to each other. Durkheim saw education in terms of its ability to move society toward consensus; Weber was more concerned with education as a force to differentiate roles within society.

In a sense, Durkheim was a product of his time and place. France, at the end of the nineteenth century and at the beginning of the twentieth, was undergoing a tremendous upheaval of the very foundations of its national culture. The church was losing its central place in the culture, and nothing seemed to be available which could replace its function. Apart from its purely theological and liturgical activities, the Church had served as the central pivot around which society organized itself. It had taught what was honorable and good for a man to do. It had taught the limitations within which a man was obedient to his state and to his ruler. It had formed the basis for family and class relationships. In other words, it had served the function of cementing French society, of developing a consensus of opinion and belief upon which social activity could be based.

As French society became more secularized, and especially as the power of the secular republican government entrenched itself by securing ascendancy through the struggles surrounding the Dreyfus affair, French society was left more and more without an agency which could teach the new social doctrine. Durkheim, studying the French problem, saw that the schools might replace the Church in promoting a national consensus out of which political and social stability might arise. A society needs some agency through which to secure the loyalty of its disparate units. The schools might be used to propagandize for the republican form of government and for the system of values which upheld it, and thereby to form a base of national opinion upon which a new and different French national culture might develop. In order to develop that culture, the educational system would have to be as open and universal as possible. There could be few restrictions in entrance, and support of the educational enterprise would have to be fixed and regularized to assure continuing educational opportunity in order to insure continuing and universal exposure to the approved point of view.

Much of this may seem to stray a long way from the matter of

collecting materials to support students' quests for information in the environmental sciences. However, I will argue that before the scientist and the technician can get to work on a problem, even before they can identify the many components of the problem, it will be necessary to create a climate which can support the radical changes that dealing with environmental problems will occasion in every area of life. The greatest difficulties which we will encounter in restructuring our role in our environment are not likely to come from designing the machines which will cleanse our atmosphere, but in creating the human culture which will allow the machines to be put to work. As Durkheim realized, there must be some mechanism in society which makes people *want* to do what they *have* to do. The observation is no less true in the area of reclaiming environmental purity than in any other area.

Part of what a library does when it builds collections is to provide the nourishment and stimulus from which users can restructure for themselves the basic presuppositions upon which their social culture is based. So long as the society and its problems are relatively static, a library, or any other educational agency, can confine itself to replicating the past, to reinforcing the status quo. But when problems confront a society which are not readily solved by reference to past achievements, the library must become an "opinion leader." At least it must furnish the materials from which a new view and new solutions more appropriate to new problems can be fashioned. In other words, people will not begin to act until they believe they have a problem, and they will not begin to solve the problem until they feel they want to make the necessary adjustments and sacrifices.

It is not difficult to find evidence that we do, indeed, have a problem. Everyone from former Secretary General of the United Nations, U Thant, to the neighbor next door has made some remark about the problem which confronts us. However, let us hear from one of the earliest and most vocal of all presentday prophets, Barry Commoner:

The ecological facts of life are grim. The survival of all living things—including man—depends on the integrity of the complex web of biological processes which comprise the earth's ecosystems. However, what man is now doing on the earth violates this fundamental requisite of human existence. For modern technologies act on the ecosystem which supports us in ways that threaten its stability; with tragic perversity we have linked much of our productive economy to precisely those features of technology which are ecologically destructive. These powerful, deeply entrenched relationships have locked us into a self-destructive course. If we are to break out of this suicidal track we must begin by learning the ecological facts of life.<sup>1</sup>

We must not assume that because Commoner uses terms like "biological processes" and "ecosystems," that the problem is scientifically or technologically rooted. The problem lies not in technology, but in the use of technology, and the use of technology is based upon the consensus of opinion in society of what is the "right" or "proper" or perhaps "most progressive"

use of technology. In order to develop different technical tools or to redirect existing ones, it will require a redirection of our thinking about how our inventiveness ought to be used. A library, together with other educational agencies, must provide the ideas and the basic informational data out of which a new ideal can arise. The task is not limited to providing technical data on the basis of which our scientists can fashion a nonpolluting engine, although that is an important matter.

Here, however, I wish to emphasize the important role librarians play in restructuring thinking concerning our problem. I do so because I think this is the point in collection building where librarians will be left most alone. We will probably have no end of help from the social and natural scientists when we begin to build collections of hard data. But helpers are not as likely to step forward when we attempt to build collections of ideas out of which to build new social values. Even on a liberal arts college campus, faculty are likely to think of themselves in terms of their specialties rather than to think of themselves as agents for the promotion of social cohesion. The problem we set ourselves, that of providing the grist for a new set of priorities concerning our environment, is a highly complex one. I would like to illustrate some of the complexities of the issue. In doing so, perhaps we will clarify the nature of the collections we must build to do the job.

Generally speaking, the nature of the environmental problem is stated in terms of disregarding the cyclical relationships in ecology. Barbara Ward speaks of spaceship earth; Barry Commoner of the ecosphere, but in each case the idea is the same. Briefly, our environment is self-contained. We cannot escape it nor can we replace it. Human and animal life on the planet earth is like that on a lone spaceship journeying far and long from a home base. There is not enough room for unlimited supplies of food, air and water. Unless those precious commodities are somehow recycled there will not be enough for the return flight. Furthermore, even if there were once enough water, for example, for a round trip, the waste from human consumption could not be stored in the fresh water tanks. In a sense, of course, that is what we have done. Since the abundance of supply seemed unlimited, we have dumped our garbage upon our natural resources. And for a long, long time it made no difference. Now, however, we are reaching a point where our own waste threatens to replace natural resources—or at least to poison them—and to kill us.

While the idea of the ecosystem is not so hard to understand, it will be difficult to implement. Indeed Kenneth Boulding says:

What is clear in the midst of all this uncertainty is that in the light of the enormous intellectual and moral task which lies ahead of mankind the political revolutions of the last 200 years fade into relative insignificance. Neither the American, the French, nor the Russian revolutions created fundamental changes in the state of man. The ideologies which supported them are

quite inadequate to bear the weight of this enormous transition which man faces.<sup>2</sup>

Just why the adjustment would be so enormous may become evident if we follow a few interesting byways.

Religion is an area we may have thought we could put safely aside when we consider building our collections concerning environmental sciences. There may be a few theologians among us who understand that religion was once considered the queen of the sciences, particularly because it tied everything together. But by and large our minds do not immediately turn to God when we consider the problems of cleaning a polluted stream. However, Lynn White, in an article published in *Science* some years ago, recounted the role which religion has played in creating a view, commonly held in Western society, which supports our exploitive attitude toward the earth. What people do about their environment depends upon what they think of themselves. "Human ecology is," White says, "deeply conditioned by beliefs about our nature and destiny—that is, by religion."<sup>3</sup> The Western branch of the Church has built an extremely anthropocentric—man-centered—religion in which human beings stand against natural environment. Man is the center of God's creation, and he views all of nature as planned for his benefit. No item in the physical creation has any purpose except to serve mankind. One may contrast this view with that of the pagan religions which Christianity replaced. Generally, the pagan religions were animistic. To them natural objects possessed guardian spirits whom men consulted out of respect and fear before attempting to utilize their resources. There is no such inhibition in Christianity where man has a monopoly on spirit in this world. What is best for man's immediate needs must therefore be best for nature.

Moreover, in the Latin West, the religious study of nature became a way of revealing the mind of God. However, Western man did not hold nature in awe because God spoke through it. Instead, he examined it, took it apart, manipulated it, and sought mastery over it. Technology expressed in a very practical way the Christian dogma of man's rightful mastery over nature. White does pay tribute to Saint Francis of Assisi who attempted to reorient the Church's thinking about nature. "With him," White says, "the ant is no longer simply a homily for the lazy, flames a sign of the thrust of the soul toward union with God; now they are Brother Ant and Sister Fire, praising the Creator in their own ways as Brother Man does in his."<sup>4</sup> But St. Francis was an exception whose example did not prevail. Today technology and science are "so tinctured with orthodox Christian arrogance toward nature that no solution for our ecologic crisis can be expected from them alone." Despite St. Francis, the prevailing contemporary view is that we are not "in our hearts, part of the natural process. We are superior to nature, contemptuous of it, willing to use it for our slightest whim."<sup>4</sup>

To change our ways in our own environment will require that we change some preconceptions about our relationship to the things about us, preconceptions which have been a part of Western tradition for nearly 2,000 years. All our literature, our nursery rhymes, our folktales contain traces of our basic arrogance toward natural phenomena. To change our basic attitudes in spite of these constant supports for a now outmoded world view will be a difficult, perhaps impossible task.

The point is that if our environmental crisis is as close at hand as most commentators claim, then we in the libraries, together with all other agencies of public education must find ways to provide the knowledge which a large portion of our public needs to promote the appropriate evolution of a new view.

It is not only our historic roots which lead us to an understanding of the great difficulty of our task. We might look at some of the more immediate difficulties even if we are inclined to change basic attitudes. How can we create a strong enough sense of public concern to persuade people to sacrifice private gratification for the public good? What are some of the problems which will attend the development of a political and economic order which can advance the public good? Kenneth Boulding calls this a classic example of the "freeloading" problem.<sup>5</sup> The individual interest is to go on polluting as long as the rest of society picks up the tab. To avoid such behavior, a sense of political awareness and of political community must be developed. Unfortunately, political action is often replaced by rhetoric whenever there is a strong conflict between public and private good. And is not this in itself a preconception about the way things "have" to be? Individuals, we believe, have an innate right to press for their own advancement even in the face of potential damage to someone else. "He" has to take care of himself. But if the individual cannot exist apart from the rest of his society, does not the society have a right to restrain the individual?

And will that individual be happier if the restraint is something he applies upon himself because he "wants" to do it that way rather than if it is something he is legally required to do? Can we indeed find restraints which are effective upon individuals? Or are legal restraints unlikely to suffice because individual transgressions taken separately are so small and so difficult to detect? It is a relatively simple matter to enforce pollution control upon large factories, but it is next to impossible to control the individual polluter who may throw something into his sewer undetected. In this regard, note the way in which we have, to date, dealt with automobile pollution. To the degree that we have been successful in cleaning auto emissions, we have done it by requiring the large manufacturer to alter his standards. We have not, in any real sense, made the individual motorer responsible for his own pollution. This may be an inadequate example because there is probably little that the

individual could do to alter his automobile, even if he were so inclined, unless the auto manufacturers developed the technology—the antipollution device which the individual could attach to his car. But it has been much simpler to place controls upon a few, large firms, than to require every auto owner to furnish proof of maintaining his auto at optimum performance levels to prevent polluting exhaust. Notice how we get around, once more, to the necessity for a consensus which will make the individual want to do what he ought to do.

Let me cite just one more example of the difficulties encountered in creating a social agreement which differs from one held in the past. It seems that no matter what course we may take in solving environmental problems, we will have to alter the distribution of income and wealth. Economically speaking, most of our pollution problems have occurred because more people have become wealthier. The more wealth people have, the more of the world's resources they tend to use, and more importantly, the more refuse they tend to slough off. It is this refuse that threatens to engulf us. The most obvious way to reduce the strain on the environment, therefore, is to stop the poor getting richer—that is, to redistribute income back towards the rich again. As Boulding points out, "We will tend to solve the problem of the automobile by taxing it heavily so as to support electrically powered public transportation which would push us back to about 1900, when automobiles were the privilege of the rich and public transportation was the much less convenient privilege of the poor."<sup>6</sup> Needless to say, the rising middle class is not likely to take kindly to becoming the falling middle class, especially if the rich get the benefit of their sacrifice. Before long such a solution would create a whole chain of new problems which would probably be as devastating as the environmental problem it attempted to solve. Once again, the question is how do you get people to see their responsibilities to one another in a view sophisticated enough to alleviate one problem without creating another. Once again it is a matter of developing a consensus of public opinion which will encourage individuals to do what they must do.

I am not suggesting that the librarian should advocate the particular social understanding which our society should adopt. As librarians (that is, in our public capacity as educator/librarian) we are constrained from proselytizing for a particular attitude. What we must do is to provide the materials for the debates which must occur in what John Stuart Mill has called the marketplace of ideas. We would not be living according to our own sense of mission if we did not do everything within our power to assure that the exchange of ideas in that marketplace was as free, open and informed as possible.

Let us look for a moment at where we have gotten. We have argued that to be a librarian is to be an educator, and that one of the important

social functions of education is to make people want to do what they have to do. In dealing with our environmental problems, wanting to do what we have to do will require people to change their attitudes about a whole range of things from their religious conceptions to their political and economic notions. The librarian can contribute to that change, not by advancing a particular notion of what values must replace the old, but by providing the information upon which the public discussion can be based.

There are several implications in all this that I would like to highlight:

1. I believe it is the librarian's responsibility to discover those areas where public debate is necessary and to provide collections in those areas so that the new notions which replace the old will be based upon as complete a knowledge base as possible.
2. I do not believe that a librarian can be true to his professional responsibilities if he ignores or fails to build collections in these developing areas because they may be controversial or because the debate will be protracted and heated. For a librarian at least, promoting ignorance is not bliss, it is an avoidance of responsibility.
3. Because the goal we seek is a new society-wide understanding, the collections we build must be open.

They must be open in at least three ways. The collection must be physically open and available to our constituency. That is, all legitimate inquiries must be welcome, and the mechanisms for informing the user—catalogs, bibliographies, or other finding guides—must be adequate to the task. The collection must also be intellectually available to our users. In other words, we must seek to reach all our legitimate constituents at the level of their ability to understand. Let us admit that we have undergraduates who cannot follow a technical economic study of the implications of our behavior within our environment. For them we must seek out the popularizer. Finally, the collection must be constitutionally open. That is, it must be really comprehensive in the sense that it attempts to provide all the materials in all subject areas which bear upon the problem regardless of whether those materials fall in the Dewey decimal classification we would anticipate for environmental studies or not. We must beware of interpreting our task too narrowly. As we have seen, the environmental problem may be less a technical problem than a philosophic or human one. Finally, the undertaking is enormous. A society does not change its mores overnight. We must not become discouraged by the length or complexity of the task. We, too, as librarians will have to change our attitudes and we may well feel like Alice in Wonderland.

"Well, in our country," said Alice, still panting a little, "you'd generally get to somewhere else—if you ran very fast for a long time as we've been doing."

"A slow sort of country!" said the Queen. "Now, here, you see, it takes all the running you can do, to keep in the same place."

Now if we may return to our second sociologist, Max Weber, I would like to illustrate, very briefly, a second responsibility we must understand in collection building. Weber assumed the sort of social consensus which Durkheim believed the schools could help promote; but then, the situation in Germany was considerably different. For Germans, the period following the war with Napoleon was a period of consolidation. The German empire was consolidated under William I and, of course, Bismarck was instrumental in creating a national unity of spirit out of the political union of north and south Germany. As the Germans made rapid cultural, scientific and technological strides, their use of education was somewhat different from what Durkheim suggested in France. They rapidly realized that no advanced, technologically sophisticated society could function if all members of society were educated in the same way. There must be some mechanism to differentiate roles, to apportion people into specialized areas where the social need is greatest. To do so, the Germans rapidly developed their universities as institutions of pure research, and, of course, they had had a tradition of that persuasion anyway. They also rapidly expanded educational programs in technical and scientific areas. The nation's educational system was directed at leading the student who was capable toward increasingly specialized training. We, in America, did the same sort of thing after Sputnik. Even though our tradition is that of the comprehensive high school, we rapidly developed funding for increased scientific education in our schools. NDEA funds were made available to libraries for the purchase of scientifically oriented materials. Since, for a change, we realized that we were part of a world community, opportunities and funds were also enlarged in foreign language study.

All of the furor which developed around the Russian space probe seems a bit curious fifteen years later. However, from this distance we can see both the Durkheim and the Weber effect in operation. It did not take Americans long to reach the consensus necessary to promote rapid expansion of scientific programs. That is probably because the adjustment did not require a wide shift in public opinion. American nationalistic thought already provided the base. We wanted to be the best in everything. Once we discovered an area where we might not be the best, we rapidly shifted our attention to it and provided both the social and financial support necessary to produce more scientists.

It is interesting to note that once the programs exist, they continue to deliver graduates with regularity until a new national priority comes along to

shift resources away from them. In a sense, we have a cyclical relationship, the new consensus shifts attention toward new specialties, but once the specialties exist, they contribute to maintaining the consensus because of the vested interests of those who have been trained in those specialties. Also, the mere existence of special programs attracts people to the specialty. The phenomenon can be seen to operate on a college campus as well. If there are courses in, for example, geography or geophysics, some students will be attracted to them by contact with other students and faculty who are studying in those areas, even though the student may not have intended to pursue that specialty when he entered college. The library and its collection plays an important part in directing students toward specialties which they may not have considered previously, if the library holds collections in those areas. The library can help to determine how students will differentiate themselves according to subject specialties by purchasing collections in areas where the student is free to study at his own rate even though the college may offer no formal courses in those areas. Our primary responsibility as librarians in a liberal arts college is probably to support the curriculum which the college does offer; nevertheless, we have a responsibility to open up the vast world of subject specialization to the student.

I do not intend to spend anymore time discussing the library's responsibility toward promoting specialization, because, as I have mentioned earlier, I believe the librarian is likely to have all the help he can use from the faculty. There will certainly be special areas, especially those outside the college curriculum, where the librarian will have to use his own discretion about what he will purchase. But usually a well-trained librarian will have no difficulty in identifying the appropriate booklists and buying guides to put together a basic collection in the area.

While I will not spend any more time describing how we built and are continuing to build our collection, I cannot resist making just two more observations. First we are sometimes too concerned about selecting the right book rather than about building the best collection. It is, of course, easier to concentrate upon an individual book and to inquire whether the author wrote well, or whether the book has a sturdy binding. However, I doubt whether it is usually the one book which is decisive in helping a student arrange his personal system of priorities. Often it has more to do with the depth of the collection, the importance it is given by the librarian who interprets it to him, and the significance it is given by his faculty and friends. I believe this speaks to the absolutely imperative task we have of making the collection known through whatever public relations schemes we can devise.

Finally, I believe we librarians have a tendency to consider ourselves a thing apart and to concentrate upon those activities which do, indeed, occupy most of our time. While circulation routines, and all the other systems we may

devise are terribly important, they are only a means toward accomplishing our basically educational task. I believe it does make a difference if we ask, "How can we best educate our students through the library's collection?" rather than "How can we best circulate our books?" And if we are to be educators as well as librarians, our understanding of the educational task must keep pace with the progress of educational researchers and theorists who will probably not be aware of the library's teaching potential. Our specialty is the library, but part of the responsibility of the specialist is to fit his work into the larger task of which it is a part. I think the Cheshire Cat summed it all up nicely:

"Cheshire-Puss," [Alice began] . . . "Would you tell me, please, which way I ought to go from here?"

"That depends a good deal on where you want to get to," said the Cat.

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## A Summary and Overview of the Conference

There were fifteen speakers at this Institute, excluding chairpersons and makers of announcements. I was asked to summarize and bring out the highlights of their remarks. I shall leave aside the details and specifics of individual titles and focus on matters of more general import. I shall speak of those ways in which it seemed the remarks and concerns of the speakers at this conference are typical of what (good) librarians do in regard to any specified subject. Later I shall discuss the ways in which they are not.

1. A good librarian usually becomes aware of an emerging problem area of general interest reasonably early, and of its ramifications and implications.

Several speakers pointed out how recently the problem of environmental control has come into the limelight, and how pervasive it is. In 1965, according to Quigley, the ACS made its initial decision to work on the problem. The National Environmental Policy Act was passed in 1969, but according to Friedlander EPA is already funding 4,000 projects. Zimmerman pointed out that only in the last few years have standard tools like the *Subject Guide to Books in Print* and the *Monthly Catalog of United States Government Publications*, used some of the appropriate subject headings. On the other hand, Veyette reported that *Engineering Index* has used subject headings dealing with the pollution of the environment since before 1900, but that was for technical literature for engineers and apparently had no great impact.

The problems of environmental control are of major import to all main types of libraries. Richardson described how a high school student project in this area involved and affected the school library. The public library is involved and concerned generally, and Collins and Zimmerman described the special involvement of the Denver and Chicago public libraries respectively. Academic libraries get involved in supporting research (which Metcalf and Davis

described) and study (Friedlander and George); relevant special libraries get very much involved also, as discussed by Imberman and Anglemeyer.

This is at least the fourth conference for librarians on this subject in 1972; in the spring there was a week-long one at Kalamazoo by the Western Michigan University library school; in the summer there was a one-day meeting in connection with the Special Libraries Association annual conference; and in September there was a three-day National Environmental Information Symposium at Cincinnati, by EPA.

2. A good librarian learns how to identify relevant materials and their sources.

Over the years librarians have learned to cope with pamphlets and other ephemeral materials, with phonograph records and films, with "unpublished" research reports, with reprints, and today or tomorrow we will have to deal with video-cassettes and magnetic tapes, and who knows what else? Almost every speaker said that there is a tremendous amount of literature relative to the environmental sciences (Thomas noted that more than eighty federal government agencies are still involved, and Veyette said that it is hard for any one person to stay abreast of all the current literature in even a specialized area of the field), and that it is not well indexed, or as neat and tidy as we would like it to be. I have absolutely no doubt that librarians (at least good librarians) can cope with these problems. One reason for this confidence is that in ten years, the course in government documents (at the University of Illinois Library School) has gone from one to three sections a year solely on the basis of student choices, showing that students sense the ever-growing importance of documents and want to be as well-prepared as possible to cope with them. We will need money and we will need time; we may not get either, but if we do I am certain that we can solve these technical problems.

Metcalf said several times during this conference that he hoped that the University of Illinois Library has a particular paper-covered research report which he considered important for future efforts to build on; knowing the University of Illinois Library as well as I do, I am confident that it does have that report and has it bound, cataloged, classified, and sitting on a shelf somewhere ready to be used. I would guess that the first major contribution of librarianship to the cause of environmental science will be in the field of bibliography, appropriately enough.

3. A good librarian learns rather quickly how to select appropriate materials for purchase or acquisition, and to cooperate with other agencies in increasing total availability of library holdings.

As Brodine told us, many current books on environmental problems for the general reader have been hastily written and are not always well done. Zimmerman said that the criteria he uses for selecting books in the environmental sciences are essentially those used by the Chicago Public Library for selecting other books and, specifically, science books. And Friedlander, too, reported using the standard selection tools for science books. Librarians have learned to examine a copy of a book, if possible, before buying it, but this is not always easy or convenient in technical fields. I liked what George said in this connection, essentially, "Don't worry too much about the merits of each particular book, but try to get a good collection and publicize it."

Several speakers pointed out the desirability of knowing the specific purposes of a given collection, so that you can tell what is relevant and what is not. Librarians have long ago reconciled themselves to not having in one library everything on a given subject, and to relying on other libraries and on other types of libraries for things their own library does not have now or may never have had. The idea of a national system or network of libraries is far from perfected or finished, but in practice it works reasonably well, sometimes (as Imberman said) because librarians themselves agree informally to make it work. We have learned to make devices like union catalogs to help us locate, in other libraries, materials we do not have in ours (and both the Illinois Institute for Environmental Quality and the U.S. Environmental Protection Agency are beginning to move in this direction). Collins said that if you are going to serve well the people who come to you, you have got to know what other related agencies have and are doing. This is not done easily or automatically; there is a continual need for librarians to learn ever more about the resources and services of other libraries as well as of other agencies.

4. Librarians are able to organize materials so that they may be readily found and used.

To my recollection, not one speaker dwelt on this topic. Two Institute registrants were discussing with me the need for a special classification of materials in the environmental sciences, and each hopes to outwait the other before beginning work in this field. I am confident that either of them can do it and do it well, and maybe the most important result of this conference is that such a new special classification will have its beginnings here. But for most general-purpose libraries, we absorb materials on the environment into our general cataloging and classification schemes, perhaps with some new subject heading, cross-references, and class numbers. Librarians are so familiar with these technical tools that we forget what a botch of things is usually made when a layman tries his hand at them. I assume that the failure of the speakers to refer to these matters is at least in part because of their unspoken confidence that librarians can and will handle them effectively.

5. A good librarian helps patrons to find what they need.

Librarians have learned many devices for this end, e.g., bibliographies, literature searches, and the reference interview to pinpoint what is desired. More and better ones are needed (one of the most successful things the Illinois Institute for Environmental Quality did was to prepare and distribute a packet of selected relevant materials for elementary school children). Schneiderman said that librarians should structure a procedure for regularly following up on services rendered, to see that the information provided was indeed adequate. He also pointed out that decision-makers need digested information, and Collins said that librarians have got to analyze, package, and provide in usable form the relevant literature which they have. In this connection, a device worthy of imitation is the Library Pathfinder, begun by Charles H. Stevens in 1969 at the M.I.T. Library. A Pathfinder is a sheet of cover-stock paper devoted to one subject and including the relevant subject headings in the card catalog, a few of the important current textbooks, the relevant book classification numbers, references to appropriate pages from a few handbooks or encyclopedias on the subject, some of the best bibliographies on the subject, titles of the leading journals, the best indexes to periodical literature on the subject, etc. (These are available for \$1 from Addison-Wesley Pub. Co., Reading, Mass. 01867.)

Still, as Brodine reminded us, it is *relatively* easy to find specific information in answer to a particular question. Good librarians get to know the materials in their collections, and not just by the covers. They usually know what to recommend to a particular reader for a particular purpose; if they do not, they ought to. They also need to know who are the available subjects experts, and they do in the Denver Public Library.

6. The really good librarian will bring relevant materials to the attention of patrons who need them but do not know that they need them or may not know that they exist.

This approaches the idea of activism that Schneiderman discussed—i.e., of not waiting for people to come and ask for what they need but of taking our knowledge and expertise to those who need it without being asked. If there is only one thing you remember from this conference, I hope it will be his advice that librarians should be at least as active in getting people to use their services and books as they have been in getting those books back when they are overdue. This is certainly part of the modern concept of librarianship—i.e., a good librarian should normally and routinely keep informed on what concerns his patrons (whether they be teachers and students in a school, researchers in a laboratory, or the city councilmen and adults in a community); he should anticipate their needs for literature and for information;

he should keep up with what literature and information are available on the topics in question; and he should take the initiative in bringing the literature and information to those clients.

I think we would all agree with this in general and in principle. The usual problem is: Just how do you get to know what it is that concerns your patrons? The best single method is to get to be a member of the team which is doing the research or seeking a solution to a problem. Metcalf told us that research under the auspices of the University of Illinois Institute for Environmental Studies is being done by interdisciplinary task forces, in one case with seventy people from twelve departments. I suspect that no task force has a staff member of the university library on it. On the other hand, Richardson told us how a "media specialist" was on the curriculum team in Oak Park, and Schneiderman suggested that every buck slip for approval of a new policy ought to have a place for the comments and concurrence of the librarian. Again, some recent experience of the University of Illinois Graduate School of Library Science is relevant. In the last several years we have had grants from NSF and NLM to pay for the preparation of science and biomedical librarians. A part of these programs has been a practicum in which each student was assigned to a researcher on campus to act as his bibliographical assistant. We know that the students profited greatly from this experience, and that the research scientists also benefited from the students' services.

\* \* \*

There are at least two regards in which the remarks and concerns of several of the speakers at this conference are *not* in accord with what most librarians now typically think and do. I will try to summarize those remarks and add a few questions of my own, but I do not profess to give the answers—each of us must do that for himself.

1. Is control of the environment really a crisis problem, and is it likely that people generally are going to be willing to pay the price which will probably be required to save the environment?

Schneiderman said that, as a result of the changing needs of our society, private property rights are being circumscribed. Metcalf made the point that the more materialistic a society, the more impact it has on the environment; he quoted from *The Limits of Growth* (the study done for the Club of Rome) that man has only about fifty years in which to secure a balance between population, food supply, natural resources, pollution, and industrialization. Brodine said that environmental problems are of extreme importance to all of us, and not just to the technical experts; she also referred to the dangers of using new technological developments when we still do not know much about their by-products. In a sense, the reorientation of the ACS, as described by

Quigley, is evidence of the conviction of its members that the environmental problems are indeed serious. Both Brodine and Anglemyer referred to the international scope of environmental problems, and to the conflicting interests of countries at different levels of development. As I understand it, many of the industrially underdeveloped countries are willing to take on the environmental problems of the advanced nations in order to secure a higher standard of living for their people. Some of the underdeveloped nations feel that the drive for reforms to protect the environment are, at least in part, a disguise for neo-colonialism designed to hold back their progress and to protect the industrial advances of the developed nations.

It seems likely that zero population growth will be necessary for restoring environmental balance. Are we really ready to accept this—not just for other nations but also for our own, and not just for other people but also personally? It seems likely, as Brodine put it, that we shall have to try various social experiments to test possible solutions, and that these will probably involve basic social changes. Are we really prepared to change our way of life in order to restore and preserve the environment? George indicated how far such changes may have to go, *viz.*, a restructuring of the Christian religion as well as a restructuring of the division of wealth. None of these people are alarmists, but the inescapable conclusion seems to be that we all face a drastic reordering of our priorities and revision of our values and daily lifestyle in order to protect the environment. Are we really prepared to pay that sort of price?

2. Is the role of library materials and information (in regard to environmental problems) sufficiently important for decision-makers, technical experts and the general public that librarians are justified in changing some of their traditional attitudes in order to do all that they can?

Schneiderman wants librarians not only to be activists but to be environmental activists. This involves at least three things—(1) the dedication to environmental problems of a substantial percentage of time, money and effort of even general librarians; (2) an implicit commitment to the cause of environmental control (he did say that librarians should make their services available to those on the other side of the question, but I doubt that he would urge us assiduously to collect literature favoring steel mills in place of farms and to press that literature on zoning boards); and (3) an active involvement as librarians in the process of public discussion and ultimate political decisions on the many environmental issues. This is a far cry from what most librarians now do for any issue and specifically for environmental problems. Are we really prepared to make any such major shift?

Another way in which some of the speakers (e.g., Schneiderman,

Brodine, and Anglemeyer) would have librarians contribute to the solution of environmental problems is by working for the free or unimpeded circulation of available information, e.g., by opposing censorship of research reports, by collecting copies of the original drafts of reports, and by working inside our various overhead organizations to secure ever wider availability of internal documents. Again, this stance is different, more difficult, and more exposed than the traditional role of librarians, even including our efforts to oppose censorship of books; are we really willing to take on this new and difficult task in order possibly to protect the environment? It will certainly require a reordering of priorities, values, and goals of almost all librarians and libraries. Stephens referred to the action of the St. Louis Public Library Board of Trustees in declining a grant for the establishment of environmental information centers in several branch libraries on the ground that the proposed program would appear to depart substantially from the public library's traditional and avowed stand of neutrality in controversial issues. I suspect that the boards of trustees of most public libraries would have taken exactly the same stand.

These are not easy questions to answer, and all we can hope to have done here is to have raised the questions, thrown some light on them, and helped you begin to think about them.

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# List of Acronyms

AAAS	American Association for the Advancement of Science
AASL	American Association of School Librarians
ACS	American Chemical Society
ADC	Alloy Data Center (NBS)
AEC	Atomic Energy Commission
AID	Agency for International Development
AMIC	Analytical Methodology Information Center (EPA)
APTIC	Air POLLUTION Technical Information Center
ARAC	Aerospace Research Applications Center
ASD (H&E)	Assistant Secretary of Defense (Health & Environment)
ASD (I&L)	Assistant Secretary of Defense (Installations & Logistics)
AWS	Air Weather Service
BIOSIS	BioScience Information Service
<i>CAIN</i>	<i>Cataloging and Indexing</i>
CAS	Chemical Abstracts Service
CCMS	Committee on the Challenges of Modern Society
CEDDA	Center for Experiment Design and Data Analysis
CEI	Committee for Environmental Information
CEQ	Council on Environmental Quality
CNO	Chief of Naval Operations
COSATI	Committee on Scientific and Technical Information
CRIS	Current Research Information System (Department of Agriculture)
CRT	Cathode Ray Tube
DDC	Defense Documentation Center
DDR&E	Director of Defense Research and Engineering
DI	Department of Interior
DOD	Department of Defense
DOT	Department of Transportation
DSA	Defense Supply Agency
EARI	Engineer Agency for Resources Inventories (Army Corps of Engineers)
EDF	Environmental Defense Fund
EDS	Environmental Data Service (NOAA)
EI	Engineering Index
EIAC	Ecological Information and Analysis Center (AEC and Battelle)
EIC	Environment Information Center
EIS	Environmental Impact Statement
EIS	Environmental Information System (NSF and ORNL)

EISO	Environmental Information System Office
EMIC	Environmental Mutagens Information Center
"ENDEX"	Environmental Data Index
ENVIRON	Environmental Information Retrieval On-Line
E.O.	Executive Order
EOCC	Emergency Operations Control Center (EPA)
EPA	Environmental Protection Agency
ERIC	Educational Resources Information Center
EROS	Earth Resources Observation Systems
ESAC	Environmental Systems Applications Center
ESEA	Elementary and Secondary Education Act
ESIC	Ecological Science Information Center
FAA	Federal Aviation Administration
FAO	Food and Agricultural Organization
FDA	Food and Drug Administration
FHA	Federal Highway Administration
FSS	Federal Supply Service
GPO	Government Printing Office
GRA	<i>Government Reports Announcement</i>
GRI	<i>Government Reports Index</i>
GSA	General Services Administration
HAPAB	<i>Health Aspects of Pesticides Abstract Bulletin</i>
HEA	Higher Education Act
HEEP	Health Effects of Environmental Pollutants
HEW	Health, Education, and Welfare
HSMHA	Health Services & Mental Health Administration
HRIS	Highway Research Information System
HUD	Housing and Urban Development
IAA	<i>International Aerospace Abstracts</i>
IBD	International Biological Program
IIEQ	Illinois Institute for Environmental Quality
IRRPOS	Interdisciplinary Research Relevant to Problems of our Society
ISI	Institute for Scientific Information
JAG	Judge Advocate General
LSCA	Library Services and Construction Act
LC	Library of Congress
MAB	Man and the Biosphere
MEDLARS	Medical Literature Analysis and Retrieval System
NAL	National Agricultural Library
NASA	National Aeronautics and Space Administration
NATO	North Atlantic Treaty Organization
NAVFAC	Naval Facilities Engineering Command

NBS	National Bureau of Standards
NDEA	National Defense Education Act
NEA	National Education Association
NEDS	National Emission Data System
NEED	National Environmental Education Development (National Park Service)
NEEDS	Neighborhood Evaluation and Decision System (HSMHA)
NEIS	National Environmental Information Symposium
NEPA	National Environmental Policy Act of 1969
NERAC	New England Research Applications Center
NESA	National Environmental Study Areas
NGO	Non-Governmental Organizations
NIEHS	National Institute for Environmental Health Services
NIH	National Institutes of Health
NIOSH	National Institute of Occupational Safety & Health
NIPC	National Industrial Pollution Council
NLM	National Library of Medicine
NOAA	National Oceanic and Atmospheric Administration
NODC	National Oceanographic Data Center
NOISE	NOise Information Service
NRC	National Referral Center (Library of Congress)
NSA	Nuclear Science Abstracts
NSF	National Science Foundation
NSIC	Nuclear Safety Information Center
NSRDS	National Standard Reference Data System
NTIS	National Technical Information Service
OASIS	Oceanic & Atmospheric Scientific Information System
OCR	Office of Coal Research (Dept. of Interior)
OE	Office of Education
OEO	Office of Economic Opportunity
OHM	Oil & Hazardous Materials Incidence
OMB	Office of Management & Budget
ONR	Office of Naval Research
OOG	Office of Oil and Gas (Dept. of Interior)
ORNL	Oak Ridge National Laboratory
OST	Office of Science & Technology (Executive Office of the President)
OSW	Office of Saline Water (Dept. of Interior)
OWDC	Office of Water Data Coordination (Dept. of Interior)
OWRR	Office of Water Resources Research (Dept. of Interior)
PAWE	Program for Analysis of the World Ecosystem
PHS	Public Health Service

RALI	Resource and Land Information
RANN	Research Applied to National Needs
RFF	Resources for the Future, Inc.
SAROAD	Storage and Retrieval of Aerometric Data
SEQUIP	Study of Environmental Quality Information Programs
SIPI	Scientists' Institute for Public Information
SLAA	State and Local Assistance Act
SMEAC	Science, Mathematics, and Environmental Education Information Analysis Center
SSIE	Smithsonian's Science Information Exchange
STAR	<i>Scientific and Technical Aerospace Reports</i>
STORET	Water Quality Technical Data & Information System
SWIRS	Solid Waste Information Retrieval System (EPA)
TAB	Technical Abstract Bulletin
TADS	Technical Assistance Data
TIP	Toxicology Information Program
TIRC	Toxicology Information Response Center
TIS	Technical Information Service (Oak Ridge)
TOXICON	Toxicology Information Conversational On-Line Network
TVA	Tennessee Valley Authority
USGS	U.S. Geological Survey (Department of Interior)
UNISIST	World Science Information System
UNITAR	United Nations Institute for Training and Research
WDC	World Data Center (NOAA)
WRSIC	Water Resources Scientific Information Center (Department of Interior)

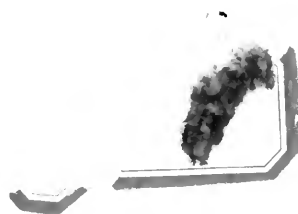














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